Aristotle - Works

[Translated under the editorship of W. D. Ross]

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Aristotle – Categories

[Translated by E. M. Edghill]

1

Things are said to be named 'equivocally' when, though they have a common name, the definition corresponding with the name differs for each. Thus, a real man and a figure in a picture can both lay claim to the name 'animal'; yet these are equivocally so named, for, though they have a common name, the definition corresponding with the name differs for each. For should any one define in what sense each is an animal, his definition in the one case will be appropriate to that case only.

On the other hand, things are said to be named 'univocally' which have both the name and the definition answering to the name in common. A man and an ox are both 'animal', and these are univocally so named, inasmuch as not only the name, but also the definition, is the same in both cases: for if a man should state in what sense each is an animal, the statement in the one case would be identical with that in the other.

Things are said to be named 'derivatively', which derive their name from some other name, but differ from it in termination. Thus the grammarian derives his name from the word 'grammar', and the courageous man from the word 'courage'.

2

Forms of speech are either simple or composite. Examples of the latter are such expressions as ‘the man runs’, ‘the man wins’; of the former ‘man’, ‘ox’, ‘runs’, ‘wins’.

Of things themselves some are predicable of a subject, and are never present in a subject. Thus ‘man’ is predicable of the individual man, and is never present in a subject.

By being ‘present in a subject’ I do not mean present as parts are present in a whole, but being incapable of existence apart from the said subject.

Some things, again, are present in a subject, but are never predicable of a subject. For instance, a certain point of grammatical knowledge is present in the mind, but is not predicable of any subject; or again, a certain whiteness may be present in the body (for colour requires a material basis), yet it is never predicable of anything.

Other things, again, are both predicable of a subject and present in a subject. Thus while knowledge is present in the human mind, it is predicable of grammar.

There is, lastly, a class of things which are neither present in a subject nor predicable of a subject, such as the individual man or the individual horse. But, to speak more generally, that which is individual and has the character of a unit is never predicable of a subject. Yet in some cases there is nothing to prevent such being present in a subject. Thus a certain point of grammatical knowledge is present in a subject.

3

When one thing is predicated of another, all that which is predicable of the predicate will be predicable also of the subject. Thus, 'man' is predicated of the individual man; but 'animal' is predicated of 'man'; it will, therefore, be predicable of the individual man also: for the individual man is both 'man' and 'animal'.

If genera are different and co-ordinate, their differentiae are themselves different in kind. Take as an instance the genus 'animal' and the genus 'knowledge'. 'With feet', 'two-footed', 'winged', 'aquatic', are differentiae of 'animal'; the species of knowledge are not distinguished by the same differentiae. One species of knowledge does not differ from another in being 'two-footed'.

But where one genus is subordinate to another, there is nothing to prevent their having the same differentiae: for the greater class is predicated of the lesser, so that all the differentiae of the predicate will be differentiae also of the subject.

4

Expressions which are in no way composite signify substance, quantity, quality, relation, place, time, position, state, action, or affection. To sketch my meaning roughly, examples of substance are 'man' or 'the horse', of quantity, such terms as 'two cubits long' or 'three cubits long', of quality, such attributes as 'white', 'grammatical'. 'Double', 'half', 'greater', fall under the category of relation; 'in a the market place', 'in the Lyceum', under that of place; 'yesterday', 'last year', under that of time. 'Lying', 'sitting',

are terms indicating position, ‘shod’, ‘armed’, state; ‘to lance’, ‘to cauterize’, action; ‘to be lanced’, ‘to be cauterized’, affection.

No one of these terms, in and by itself, involves an affirmation; it is by the combination of such terms that positive or negative statements arise. For every assertion must, as is admitted, be either true or false, whereas expressions which are not in any way composite such as ‘man’, ‘white’, ‘runs’, ‘wins’, cannot be either true or false.

5

Substance, in the truest and primary and most definite sense of the word, is that which is neither predicable of a subject nor present in a subject; for instance, the individual man or horse. But in a secondary sense those things are called substances within which, as species, the primary substances are included; also those which, as genera, include the species. For instance, the individual man is included in the species ‘man’, and the genus to which the species belongs is ‘animal’; these, therefore – that is to say, the species ‘man’ and the genus ‘animal, – are termed secondary substances.

It is plain from what has been said that both the name and the definition of the predicate must be predicable of the subject. For instance, ‘man’ is predicted of the individual man. Now in this case the name of the species man’ is applied to the individual, for we use the term ‘man’ in describing the individual; and the definition of ‘man’ will also be predicated of the individual man, for the individual man is both man and animal. Thus, both the name and the definition of the species are predicable of the individual.

With regard, on the other hand, to those things which are present in a subject, it is generally the case that neither their name nor their definition is predicable of that in which they are present. Though, however, the definition is never predicable, there is nothing in certain cases to prevent the name being used. For instance, 'white' being present in a body is predicated of that in which it is present, for a body is called white: the definition, however, of the colour white' is never predicable of the body.

Everything except primary substances is either predicable of a primary substance or present in a primary substance. This becomes evident by reference to particular instances which occur. 'Animal' is predicated of the species 'man', therefore of the individual man, for if there were no individual man of whom it could be predicated, it could not be predicated of the species 'man' at all. Again, colour is present in body, therefore in individual bodies, for if there were no individual body in which it was present, it could not be present in body at all. Thus everything except primary substances is either predicated of primary substances, or is present in them, and if these last did not exist, it would be impossible for anything else to exist.

Of secondary substances, the species is more truly substance than the genus, being more nearly related to primary substance. For if any one should render an account of what a primary substance is, he would render a more instructive account, and one more proper to the subject, by stating the species than by stating the genus. Thus, he would give a more instructive account of an individual man by stating that he was man than by stating that he was animal, for the former description is peculiar to the individual in a greater degree, while the latter is too general. Again, the man who gives an account of the nature of an individual tree will give a more instructive account by

mentioning the species 'tree' than by mentioning the genus 'plant'.

Moreover, primary substances are most properly called substances in virtue of the fact that they are the entities which underlie every. else, and that everything else is either predicated of them or present in them. Now the same relation which subsists between primary substance and everything else subsists also between the species and the genus: for the species is to the genus as subject is to predicate, since the genus is predicated of the species, whereas the species cannot be predicated of the genus. Thus we have a second ground for asserting that the species is more truly substance than the genus.

Of species themselves, except in the case of such as are genera, no one is more truly substance than another. We should not give a more appropriate account of the individual man by stating the species to which he belonged, than we should of an individual horse by adopting the same method of definition. In the same way, of primary substances, no one is more truly substance than another; an individual man is not more truly substance than an individual ox.

It is, then, with good reason that of all that remains, when we exclude primary substances, we concede to species and genera alone the name 'secondary substance', for these alone of all the predicates convey a knowledge of primary substance. For it is by stating the species or the genus that we appropriately define any individual man; and we shall make our definition more exact by stating the former than by stating the latter. All other things that we state, such as that he is white, that he runs, and so on, are irrelevant to the definition. Thus it is just that these alone, apart from primary substances, should be called substances.

Further, primary substances are most properly so called, because they underlie and are the subjects of everything else. Now the same relation that subsists between primary substance and everything else subsists also between the species and the genus to which the primary substance belongs, on the one hand, and every attribute which is not included within these, on the other. For these are the subjects of all such. If we call an individual man 'skilled in grammar', the predicate is applicable also to the species and to the genus to which he belongs. This law holds good in all cases.

It is a common characteristic of all sub. stance that it is never present in a subject. For primary substance is neither present in a subject nor predicated of a subject; while, with regard to secondary substances, it is clear from the following arguments (apart from others) that they are not present in a subject. For 'man' is predicated of the individual man, but is not present in any subject: for manhood is not present in the individual man. In the same way, 'animal' is also predicated of the individual man, but is not present in him. Again, when a thing is present in a subject, though the name may quite well be applied to that in which it is present, the definition cannot be applied. Yet of secondary substances, not only the name, but also the definition, applies to the subject: we should use both the definition of the species and that of the genus with reference to the individual man. Thus substance cannot be present in a subject.

Yet this is not peculiar to substance, for it is also the case that differentiae cannot be present in subjects. The characteristics 'terrestrial' and 'two-footed' are predicated of the species 'man', but not present in it. For they are not in man. Moreover, the definition of the differentia may be predicated of that of which the differentia itself is predicated. For instance, if the characteristic 'terrestrial' is predicated of the species 'man', the

definition also of that characteristic may be used to form the predicate of the species 'man': for 'man' is terrestrial.

The fact that the parts of substances appear to be present in the whole, as in a subject, should not make us apprehensive lest we should have to admit that such parts are not substances: for in explaining the phrase 'being present in a subject', we stated' that we meant 'otherwise than as parts in a whole'.

It is the mark of substances and of differentiae that, in all propositions of which they form the predicate, they are predicated univocally. For all such propositions have for their subject either the individual or the species. It is true that, inasmuch as primary substance is not predicable of anything, it can never form the predicate of any proposition. But of secondary substances, the species is predicated of the individual, the genus both of the species and of the individual. Similarly the differentiae are predicated of the species and of the individuals. Moreover, the definition of the species and that of the genus are applicable to the primary substance, and that of the genus to the species. For all that is predicated of the predicate will be predicated also of the subject. Similarly, the definition of the differentiae will be applicable to the species and to the individuals. But it was stated above that the word 'univocal' was applied to those things which had both name and definition in common. It is, therefore, established that in every proposition, of which either substance or a differentia forms the predicate, these are predicated univocally.

All substance appears to signify that which is individual. In the case of primary substance this is indisputably true, for the thing is a unit. In the case of secondary substances, when we speak, for instance, of 'man' or 'animal', our form of speech gives the impression that we are here also indicating that which is individual, but the impression is not strictly true; for a

secondary substance is not an individual, but a class with a certain qualification; for it is not one and single as a primary substance is; the words 'man', 'animal', are predicable of more than one subject.

Yet species and genus do not merely indicate quality, like the term 'white'; 'white' indicates quality and nothing further, but species and genus determine the quality with reference to a substance: they signify substance qualitatively differentiated. The determinate qualification covers a larger field in the case of the genus that in that of the species: he who uses the word 'animal' is herein using a word of wider extension than he who uses the word 'man'.

Another mark of substance is that it has no contrary. What could be the contrary of any primary substance, such as the individual man or animal? It has none. Nor can the species or the genus have a contrary. Yet this characteristic is not peculiar to substance, but is true of many other things, such as quantity. There is nothing that forms the contrary of 'two cubits long' or of 'three cubits long', or of 'ten', or of any such term. A man may contend that 'much' is the contrary of 'little', or 'great' of 'small', but of definite quantitative terms no contrary exists.

Substance, again, does not appear to admit of variation of degree. I do not mean by this that one substance cannot be more or less truly substance than another, for it has already been stated' that this is the case; but that no single substance admits of varying degrees within itself. For instance, one particular substance, 'man', cannot be more or less man either than himself at some other time or than some other man. One man cannot be more man than another, as that which is white may be more or less white than some other white object, or as that which is beautiful may be more or less beautiful than some other beautiful object. The same quality, moreover, is said to

subsist in a thing in varying degrees at different times. A body, being white, is said to be whiter at one time than it was before, or, being warm, is said to be warmer or less warm than at some other time. But substance is not said to be more or less that which it is: a man is not more truly a man at one time than he was before, nor is anything, if it is substance, more or less what it is. Substance, then, does not admit of variation of degree.

The most distinctive mark of substance appears to be that, while remaining numerically one and the same, it is capable of admitting contrary qualities. From among things other than substance, we should find ourselves unable to bring forward any which possessed this mark. Thus, one and the same colour cannot be white and black. Nor can the same one action be good and bad: this law holds good with everything that is not substance. But one and the selfsame substance, while retaining its identity, is yet capable of admitting contrary qualities. The same individual person is at one time white, at another black, at one time warm, at another cold, at one time good, at another bad. This capacity is found nowhere else, though it might be maintained that a statement or opinion was an exception to the rule. The same statement, it is agreed, can be both true and false. For if the statement 'he is sitting' is true, yet, when the person in question has risen, the same statement will be false. The same applies to opinions. For if any one thinks truly that a person is sitting, yet, when that person has risen, this same opinion, if still held, will be false. Yet although this exception may be allowed, there is, nevertheless, a difference in the manner in which the thing takes place. It is by themselves changing that substances admit contrary qualities. It is thus that that which was hot becomes cold, for it has entered into a different state. Similarly that which was white becomes black, and that which was bad good, by a process of change; and in the same way in all other cases it is by changing that substances are capable of admitting contrary qualities. But statements and

opinions themselves remain unaltered in all respects: it is by the alteration in the facts of the case that the contrary quality comes to be theirs. The statement 'he is sitting' remains unaltered, but it is at one time true, at another false, according to circumstances. What has been said of statements applies also to opinions. Thus, in respect of the manner in which the thing takes place, it is the peculiar mark of substance that it should be capable of admitting contrary qualities; for it is by itself changing that it does so.

If, then, a man should make this exception and contend that statements and opinions are capable of admitting contrary qualities, his contention is unsound. For statements and opinions are said to have this capacity, not because they themselves undergo modification, but because this modification occurs in the case of something else. The truth or falsity of a statement depends on facts, and not on any power on the part of the statement itself of admitting contrary qualities. In short, there is nothing which can alter the nature of statements and opinions. As, then, no change takes place in themselves, these cannot be said to be capable of admitting contrary qualities.

But it is by reason of the modification which takes place within the substance itself that a substance is said to be capable of admitting contrary qualities; for a substance admits within itself either disease or health, whiteness or blackness. It is in this sense that it is said to be capable of admitting contrary qualities.

To sum up, it is a distinctive mark of substance, that, while remaining numerically one and the same, it is capable of admitting contrary qualities, the modification taking place through a change in the substance itself.

Let these remarks suffice on the subject of substance.

6

Quantity is either discrete or continuous. Moreover, some quantities are such that each part of the whole has a relative position to the other parts: others have within them no such relation of part to part.

Instances of discrete quantities are number and speech; of continuous, lines, surfaces, solids, and, besides these, time and place.

In the case of the parts of a number, there is no common boundary at which they join. For example: two fives make ten, but the two fives have no common boundary, but are separate; the parts three and seven also do not join at any boundary. Nor, to generalize, would it ever be possible in the case of number that there should be a common boundary among the parts; they are always separate. Number, therefore, is a discrete quantity.

The same is true of speech. That speech is a quantity is evident: for it is measured in long and short syllables. I mean here that speech which is vocal. Moreover, it is a discrete quantity for its parts have no common boundary. There is no common boundary at which the syllables join, but each is separate and distinct from the rest.

A line, on the other hand, is a continuous quantity, for it is possible to find a common boundary at which its parts join. In the case of the line, this common boundary is the point; in the case of the plane, it is the line: for the parts of the plane have also a common boundary. Similarly you can find a common boundary in the case of the parts of a solid, namely either a line or a plane.

Space and time also belong to this class of quantities. Time, past, present, and future, forms a continuous whole. Space, likewise, is a continuous quantity; for the parts of a solid occupy a certain space, and these have a common boundary; it follows that the parts of space also, which are occupied by the parts of the solid, have the same common boundary as the parts of the solid. Thus, not only time, but space also, is a continuous quantity, for its parts have a common boundary.

Quantities consist either of parts which bear a relative position each to each, or of parts which do not. The parts of a line bear a relative position to each other, for each lies somewhere, and it would be possible to distinguish each, and to state the position of each on the plane and to explain to what sort of part among the rest each was contiguous. Similarly the parts of a plane have position, for it could similarly be stated what was the position of each and what sort of parts were contiguous. The same is true with regard to the solid and to space. But it would be impossible to show that the arts of a number had a relative position each to each, or a particular position, or to state what parts were contiguous. Nor could this be done in the case of time, for none of the parts of time has an abiding existence, and that which does not abide can hardly have position. It would be better to say that such parts had a relative order, in virtue of one being prior to another. Similarly with number: in counting, 'one' is prior to 'two', and 'two' to 'three', and thus the parts of number may be said to possess a relative order, though it would be impossible to discover any distinct position for each. This holds good also in the case of speech. None of its parts has an abiding existence: when once a syllable is pronounced, it is not possible to retain it, so that, naturally, as the parts do not abide, they cannot have position. Thus, some quantities consist of parts which have position, and some of those which have not.

Strictly speaking, only the things which I have mentioned belong to the category of quantity: everything else that is called quantitative is a quantity in a secondary sense. It is because we have in mind some one of these quantities, properly so called, that we apply quantitative terms to other things. We speak of what is white as large, because the surface over which the white extends is large; we speak of an action or a process as lengthy, because the time covered is long; these things cannot in their own right claim the quantitative epithet. For instance, should any one explain how long an action was, his statement would be made in terms of the time taken, to the effect that it lasted a year, or something of that sort. In the same way, he would explain the size of a white object in terms of surface, for he would state the area which it covered. Thus the things already mentioned, and these alone, are in their intrinsic nature quantities; nothing else can claim the name in its own right, but, if at all, only in a secondary sense.

Quantities have no contraries. In the case of definite quantities this is obvious; thus, there is nothing that is the contrary of 'two cubits long' or of 'three cubits long', or of a surface, or of any such quantities. A man might, indeed, argue that 'much' was the contrary of 'little', and 'great' of 'small'. But these are not quantitative, but relative; things are not great or small absolutely, they are so called rather as the result of an act of comparison. For instance, a mountain is called small, a grain large, in virtue of the fact that the latter is greater than others of its kind, the former less. Thus there is a reference here to an external standard, for if the terms 'great' and 'small' were used absolutely, a mountain would never be called small or a grain large. Again, we say that there are many people in a village, and few in Athens, although those in the city are many times as numerous as those in the village: or we say that a house has many in it, and a theatre few, though those in the theatre far outnumber those in the house. The terms 'two cubits long,

"three cubits long,' and so on indicate quantity, the terms 'great' and 'small' indicate relation, for they have reference to an external standard. It is, therefore, plain that these are to be classed as relative.

Again, whether we define them as quantitative or not, they have no contraries: for how can there be a contrary of an attribute which is not to be apprehended in or by itself, but only by reference to something external? Again, if 'great' and 'small' are contraries, it will come about that the same subject can admit contrary qualities at one and the same time, and that things will themselves be contrary to themselves. For it happens at times that the same thing is both small and great. For the same thing may be small in comparison with one thing, and great in comparison with another, so that the same thing comes to be both small and great at one and the same time, and is of such a nature as to admit contrary qualities at one and the same moment. Yet it was agreed, when substance was being discussed, that nothing admits contrary qualities at one and the same moment. For though substance is capable of admitting contrary qualities, yet no one is at the same time both sick and healthy, nothing is at the same time both white and black. Nor is there anything which is qualified in contrary ways at one and the same time.

Moreover, if these were contraries, they would themselves be contrary to themselves. For if 'great' is the contrary of 'small', and the same thing is both great and small at the same time, then 'small' or 'great' is the contrary of itself. But this is impossible. The term 'great', therefore, is not the contrary of the term 'small', nor 'much' of 'little'. And even though a man should call these terms not relative but quantitative, they would not have contraries.

It is in the case of space that quantity most plausibly appears to admit of a contrary. For men define the term ‘above’ as the contrary of ‘below’, when it is the region at the centre they mean by ‘below’; and this is so, because nothing is farther from the extremities of the universe than the region at the centre. Indeed, it seems that in defining contraries of every kind men have recourse to a spatial metaphor, for they say that those things are contraries which, within the same class, are separated by the greatest possible distance.

Quantity does not, it appears, admit of variation of degree. One thing cannot be two cubits long in a greater degree than another. Similarly with regard to number: what is ‘three’ is not more truly three than what is ‘five’ is five; nor is one set of three more truly three than another set. Again, one period of time is not said to be more truly time than another. Nor is there any other kind of quantity, of all that have been mentioned, with regard to which variation of degree can be predicated. The category of quantity, therefore, does not admit of variation of degree.

The most distinctive mark of quantity is that equality and inequality are predicated of it. Each of the aforesaid quantities is said to be equal or unequal. For instance, one solid is said to be equal or unequal to another; number, too, and time can have these terms applied to them, indeed can all those kinds of quantity that have been mentioned.

That which is not a quantity can by no means, it would seem, be termed equal or unequal to anything else. One particular disposition or one particular quality, such as whiteness, is by no means compared with another in terms of equality and inequality but rather in terms of similarity. Thus it is the distinctive mark of quantity that it can be called equal and unequal.

7

Those things are called relative, which, being either said to be of something else or related to something else, are explained by reference to that other thing. For instance, the word 'superior' is explained by reference to something else, for it is superiority over something else that is meant. Similarly, the expression 'double' has this external reference, for it is the double of something else that is meant. So it is with everything else of this kind. There are, moreover, other relatives, e.g. habit, disposition, perception, knowledge, and attitude. The significance of all these is explained by a reference to something else and in no other way. Thus, a habit is a habit of something, knowledge is knowledge of something, attitude is the attitude of something. So it is with all other relatives that have been mentioned. Those terms, then, are called relative, the nature of which is explained by reference to something else, the preposition 'of' or some other preposition being used to indicate the relation. Thus, one mountain is called great in comparison with son with another; for the mountain claims this attribute by comparison with something. Again, that which is called similar must be similar to something else, and all other such attributes have this external reference. It is to be noted that lying and standing and sitting are particular attitudes, but attitude is itself a relative term. To lie, to stand, to be seated, are not themselves attitudes, but take their name from the aforesaid attitudes.

It is possible for relatives to have contraries. Thus virtue has a contrary, vice, these both being relatives; knowledge, too, has a contrary, ignorance. But this is not the mark of all relatives; 'double' and 'triple' have no contrary, nor indeed has any such term.

It also appears that relatives can admit of variation of degree. For 'like' and 'unlike', 'equal' and 'unequal', have the modifications 'more' and 'less' applied to them, and each of these is relative in character: for the terms 'like' and 'unequal' bear 'unequal' bear a reference to something external. Yet, again, it is not every relative term that admits of variation of degree. No term such as 'double' admits of this modification. All relatives have correlatives: by the term 'slave' we mean the slave of a master, by the term 'master', the master of a slave; by 'double', the double of its hall; by 'half', the half of its double; by 'greater', greater than that which is less; by 'less,' less than that which is greater.

So it is with every other relative term; but the case we use to express the correlation differs in some instances. Thus, by knowledge we mean knowledge the knowable; by the knowable, that which is to be apprehended by knowledge; by perception, perception of the perceptible; by the perceptible, that which is apprehended by perception.

Sometimes, however, reciprocity of correlation does not appear to exist. This comes about when a blunder is made, and that to which the relative is related is not accurately stated. If a man states that a wing is necessarily relative to a bird, the connexion between these two will not be reciprocal, for it will not be possible to say that a bird is a bird by reason of its wings. The reason is that the original statement was inaccurate, for the wing is not said to be relative to the bird qua bird, since many creatures besides birds have wings, but qua winged creature. If, then, the statement is made accurate, the connexion will be reciprocal, for we can speak of a wing, having reference necessarily to a winged creature, and of a winged creature as being such because of its wings.

Occasionally, perhaps, it is necessary to coin words, if no word exists by which a correlation can adequately be explained. If we define a rudder as necessarily having reference to a boat, our definition will not be appropriate, for the rudder does not have this reference to a boat qua boat, as there are boats which have no rudders. Thus we cannot use the terms reciprocally, for the word 'boat' cannot be said to find its explanation in the word 'rudder'. As there is no existing word, our definition would perhaps be more accurate if we coined some word like 'ruddered' as the correlative of 'rudder'. If we express ourselves thus accurately, at any rate the terms are reciprocally connected, for the 'ruddered' thing is 'ruddered' in virtue of its rudder. So it is in all other cases. A head will be more accurately defined as the correlative of that which is 'headed', than as that of an animal, for the animal does not have a head qua animal, since many animals have no head.

Thus we may perhaps most easily comprehend that to which a thing is related, when a name does not exist, if, from that which has a name, we derive a new name, and apply it to that with which the first is reciprocally connected, as in the aforesaid instances, when we derived the word 'winged' from 'wing' and from 'rudder'.

All relatives, then, if properly defined, have a correlative. I add this condition because, if that to which they are related is stated as haphazard and not accurately, the two are not found to be interdependent. Let me state what I mean more clearly. Even in the case of acknowledged correlatives, and where names exist for each, there will be no interdependence if one of the two is denoted, not by that name which expresses the correlative notion, but by one of irrelevant significance. The term 'slave,' if defined as related, not to a master, but to a man, or a biped, or anything of that sort, is not reciprocally connected with that in relation to which it is defined, for the statement is not exact.

Further, if one thing is said to be correlative with another, and the terminology used is correct, then, though all irrelevant attributes should be removed, and only that one attribute left in virtue of which it was correctly stated to be correlative with that other, the stated correlation will still exist. If the correlative of 'the slave' is said to be 'the master', then, though all irrelevant attributes of the said 'master', such as 'biped', 'receptive of knowledge', 'human', should be removed, and the attribute 'master' alone left, the stated correlation existing between him and the slave will remain the same, for it is of a master that a slave is said to be the slave. On the other hand, if, of two correlatives, one is not correctly termed, then, when all other attributes are removed and that alone is left in virtue of which it was stated to be correlative, the stated correlation will be found to have disappeared.

For suppose the correlative of 'the slave' should be said to be 'the man', or the correlative of 'the wing"the bird'; if the attribute 'master' be withdrawn from' the man', the correlation between 'the man' and 'the slave' will cease to exist, for if the man is not a master, the slave is not a slave. Similarly, if the attribute 'winged' be withdrawn from 'the bird', 'the wing' will no longer be relative; for if the so-called correlative is not winged, it follows that 'the wing' has no correlative.

Thus it is essential that the correlated terms should be exactly designated; if there is a name existing, the statement will be easy; if not, it is doubtless our duty to construct names. When the terminology is thus correct, it is evident that all correlatives are interdependent.

Correlatives are thought to come into existence simultaneously. This is for the most part true, as in the case of the double and the half. The existence of the half necessitates the existence of that of which it is a half. Similarly the existence of a master

necessitates the existence of a slave, and that of a slave implies that of a master; these are merely instances of a general rule. Moreover, they cancel one another; for if there is no double it follows that there is no half, and vice versa; this rule also applies to all such correlatives. Yet it does not appear to be true in all cases that correlatives come into existence simultaneously. The object of knowledge would appear to exist before knowledge itself, for it is usually the case that we acquire knowledge of objects already existing; it would be difficult, if not impossible, to find a branch of knowledge the beginning of the existence of which was contemporaneous with that of its object.

Again, while the object of knowledge, if it ceases to exist, cancels at the same time the knowledge which was its correlative, the converse of this is not true. It is true that if the object of knowledge does not exist there can be no knowledge: for there will no longer be anything to know. Yet it is equally true that, if knowledge of a certain object does not exist, the object may nevertheless quite well exist. Thus, in the case of the squaring of the circle, if indeed that process is an object of knowledge, though it itself exists as an object of knowledge, yet the knowledge of it has not yet come into existence. Again, if all animals ceased to exist, there would be no knowledge, but there might yet be many objects of knowledge.

This is likewise the case with regard to perception: for the object of perception is, it appears, prior to the act of perception. If the perceptible is annihilated, perception also will cease to exist; but the annihilation of perception does not cancel the existence of the perceptible. For perception implies a body perceived and a body in which perception takes place. Now if that which is perceptible is annihilated, it follows that the body is annihilated, for the body is a perceptible thing; and if the body does not exist, it follows that perception also ceases to

exist. Thus the annihilation of the perceptible involves that of perception.

But the annihilation of perception does not involve that of the perceptible. For if the animal is annihilated, it follows that perception also is annihilated, but perceptibles such as body, heat, sweetness, bitterness, and so on, will remain.

Again, perception is generated at the same time as the perceiving subject, for it comes into existence at the same time as the animal. But the perceptible surely exists before perception; for fire and water and such elements, out of which the animal is itself composed, exist before the animal is an animal at all, and before perception. Thus it would seem that the perceptible exists before perception.

It may be questioned whether it is true that no substance is relative, as seems to be the case, or whether exception is to be made in the case of certain secondary substances. With regard to primary substances, it is quite true that there is no such possibility, for neither wholes nor parts of primary substances are relative. The individual man or ox is not defined with reference to something external. Similarly with the parts: a particular hand or head is not defined as a particular hand or head of a particular person, but as the hand or head of a particular person. It is true also, for the most part at least, in the case of secondary substances; the species 'man' and the species 'ox' are not defined with reference to anything outside themselves. Wood, again, is only relative in so far as it is some one's property, not in so far as it is wood. It is plain, then, that in the cases mentioned substance is not relative. But with regard to some secondary substances there is a difference of opinion; thus, such terms as 'head' and 'hand' are defined with reference to that of which the things indicated are a part, and so it comes about that these appear to have a relative character. Indeed, if

our definition of that which is relative was complete, it is very difficult, if not impossible, to prove that no substance is relative. If, however, our definition was not complete, if those things only are properly called relative in the case of which relation to an external object is a necessary condition of existence, perhaps some explanation of the dilemma may be found.

The former definition does indeed apply to all relatives, but the fact that a thing is explained with reference to something else does not make it essentially relative.

From this it is plain that, if a man definitely apprehends a relative thing, he will also definitely apprehend that to which it is relative. Indeed this is self-evident: for if a man knows that some particular thing is relative, assuming that we call that a relative in the case of which relation to something is a necessary condition of existence, he knows that also to which it is related. For if he does not know at all that to which it is related, he will not know whether or not it is relative. This is clear, moreover, in particular instances. If a man knows definitely that such and such a thing is 'double', he will also forthwith know definitely that of which it is the double. For if there is nothing definite of which he knows it to be the double, he does not know at all that it is double. Again, if he knows that a thing is more beautiful, it follows necessarily that he will forthwith definitely know that also than which it is more beautiful. He will not merely know indefinitely that it is more beautiful than something which is less beautiful, for this would be supposition, not knowledge. For if he does not know definitely that than which it is more beautiful, he can no longer claim to know definitely that it is more beautiful than something else which is less beautiful: for it might be that nothing was less beautiful. It is, therefore, evident that if a man apprehends some relative thing definitely, he necessarily knows that also definitely to which it is related.

Now the head, the hand, and such things are substances, and it is possible to know their essential character definitely, but it does not necessarily follow that we should know that to which they are related. It is not possible to know forthwith whose head or hand is meant. Thus these are not relatives, and, this being the case, it would be true to say that no substance is relative in character. It is perhaps a difficult matter, in such cases, to make a positive statement without more exhaustive examination, but to have raised questions with regard to details is not without advantage.

8

By 'quality' I mean that in virtue of which people are said to be such and such.

Quality is a term that is used in many senses. One sort of quality let us call 'habit' or 'disposition'. Habit differs from disposition in being more lasting and more firmly established. The various kinds of knowledge and of virtue are habits, for knowledge, even when acquired only in a moderate degree, is, it is agreed, abiding in its character and difficult to displace, unless some great mental upheaval takes place, through disease or any such cause. The virtues, also, such as justice, self-restraint, and so on, are not easily dislodged or dismissed, so as to give place to vice.

By a disposition, on the other hand, we mean a condition that is easily changed and quickly gives place to its opposite. Thus, heat, cold, disease, health, and so on are dispositions. For a man is disposed in one way or another with reference to these, but quickly changes, becoming cold instead of warm, ill instead of well. So it is with all other dispositions also, unless through

lapse of time a disposition has itself become inveterate and almost impossible to dislodge: in which case we should perhaps go so far as to call it a habit.

It is evident that men incline to call those conditions habits which are of a more or less permanent type and difficult to displace; for those who are not retentive of knowledge, but volatile, are not said to have such and such a 'habit' as regards knowledge, yet they are disposed, we may say, either better or worse, towards knowledge. Thus habit differs from disposition in this, that while the latter in ephemeral, the former is permanent and difficult to alter.

Habits are at the same time dispositions, but dispositions are not necessarily habits. For those who have some specific habit may be said also, in virtue of that habit, to be thus or thus disposed; but those who are disposed in some specific way have not in all cases the corresponding habit.

Another sort of quality is that in virtue of which, for example, we call men good boxers or runners, or healthy or sickly: in fact it includes all those terms which refer to inborn capacity or incapacity. Such things are not predicated of a person in virtue of his disposition, but in virtue of his inborn capacity or incapacity to do something with ease or to avoid defeat of any kind. Persons are called good boxers or good runners, not in virtue of such and such a disposition, but in virtue of an inborn capacity to accomplish something with ease. Men are called healthy in virtue of the inborn capacity of easy resistance to those unhealthy influences that may ordinarily arise; unhealthy, in virtue of the lack of this capacity. Similarly with regard to softness and hardness. Hardness is predicated of a thing because it has that capacity of resistance which enables it to withstand disintegration; softness, again, is predicated of a thing by reason of the lack of that capacity.

A third class within this category is that of affective qualities and affections. Sweetness, bitterness, sourness, are examples of this sort of quality, together with all that is akin to these; heat, moreover, and cold, whiteness, and blackness are affective qualities. It is evident that these are qualities, for those things that possess them are themselves said to be such and such by reason of their presence. Honey is called sweet because it contains sweetness; the body is called white because it contains whiteness; and so in all other cases.

The term 'affective quality' is not used as indicating that those things which admit these qualities are affected in any way. Honey is not called sweet because it is affected in a specific way, nor is this what is meant in any other instance. Similarly heat and cold are called affective qualities, not because those things which admit them are affected. What is meant is that these said qualities are capable of producing an 'affection' in the way of perception. For sweetness has the power of affecting the sense of taste; heat, that of touch; and so it is with the rest of these qualities.

Whiteness and blackness, however, and the other colours, are not said to be affective qualities in this sense, but – because they themselves are the results of an affection. It is plain that many changes of colour take place because of affections. When a man is ashamed, he blushes; when he is afraid, he becomes pale, and so on. So true is this, that when a man is by nature liable to such affections, arising from some concomitance of elements in his constitution, it is a probable inference that he has the corresponding complexion of skin. For the same disposition of bodily elements, which in the former instance was momentarily present in the case of an access of shame, might be a result of a man's natural temperament, so as to produce the corresponding colouring also as a natural characteristic. All conditions, therefore, of this kind, if caused by

certain permanent and lasting affections, are called affective qualities. For pallor and duskiness of complexion are called qualities, inasmuch as we are said to be such and such in virtue of them, not only if they originate in natural constitution, but also if they come about through long disease or sunburn, and are difficult to remove, or indeed remain throughout life. For in the same way we are said to be such and such because of these.

Those conditions, however, which arise from causes which may easily be rendered ineffective or speedily removed, are called, not qualities, but affections: for we are not said to be such virtue of them. The man who blushes through shame is not said to be a constitutional blusher, nor is the man who becomes pale through fear said to be constitutionally pale. He is said rather to have been affected.

Thus such conditions are called affections, not qualities.

In like manner there are affective qualities and affections of the soul. That temper with which a man is born and which has its origin in certain deep-seated affections is called a quality. I mean such conditions as insanity, irascibility, and so on: for people are said to be mad or irascible in virtue of these. Similarly those abnormal psychic states which are not inborn, but arise from the concomitance of certain other elements, and are difficult to remove, or altogether permanent, are called qualities, for in virtue of them men are said to be such and such.

Those, however, which arise from causes easily rendered ineffective are called affections, not qualities. Suppose that a man is irritable when vexed: he is not even spoken of as a bad-tempered man, when in such circumstances he loses his temper somewhat, but rather is said to be affected. Such conditions are therefore termed, not qualities, but affections.

The fourth sort of quality is figure and the shape that belongs to a thing; and besides this, straightness and curvedness and any other qualities of this type; each of these defines a thing as being such and such. Because it is triangular or quadrangular a thing is said to have a specific character, or again because it is straight or curved; in fact a thing's shape in every case gives rise to a qualification of it.

Rarity and density, roughness and smoothness, seem to be terms indicating quality: yet these, it would appear, really belong to a class different from that of quality. For it is rather a certain relative position of the parts composing the thing thus qualified which, it appears, is indicated by each of these terms. A thing is dense, owing to the fact that its parts are closely combined with one another; rare, because there are interstices between the parts; smooth, because its parts lie, so to speak, evenly; rough, because some parts project beyond others.

There may be other sorts of quality, but those that are most properly so called have, we may safely say, been enumerated.

These, then, are qualities, and the things that take their name from them as derivatives, or are in some other way dependent on them, are said to be qualified in some specific way. In most, indeed in almost all cases, the name of that which is qualified is derived from that of the quality. Thus the terms 'whiteness', 'grammar', 'justice', give us the adjectives 'white', 'grammatical', 'just', and so on.

There are some cases, however, in which, as the quality under consideration has no name, it is impossible that those possessed of it should have a name that is derivative. For instance, the name given to the runner or boxer, who is so called in virtue of an inborn capacity, is not derived from that of any quality; for lob those capacities have no name assigned to them. In this, the inborn capacity is distinct from the science,

with reference to which men are called, e.g. boxers or wrestlers. Such a science is classed as a disposition; it has a name, and is called ‘boxing’ or ‘wrestling’ as the case may be, and the name given to those disposed in this way is derived from that of the science. Sometimes, even though a name exists for the quality, that which takes its character from the quality has a name that is not a derivative. For instance, the upright man takes his character from the possession of the quality of integrity, but the name given him is not derived from the word ‘integrity’. Yet this does not occur often.

We may therefore state that those things are said to be possessed of some specific quality which have a name derived from that of the aforesaid quality, or which are in some other way dependent on it.

One quality may be the contrary of another; thus justice is the contrary of injustice, whiteness of blackness, and so on. The things, also, which are said to be such and such in virtue of these qualities, may be contrary the one to the other; for that which is unjust is contrary to that which is just, that which is white to that which is black. This, however, is not always the case. Red, yellow, and such colours, though qualities, have no contraries.

If one of two contraries is a quality, the other will also be a quality. This will be evident from particular instances, if we apply the names used to denote the other categories; for instance, granted that justice is the contrary of injustice and justice is a quality, injustice will also be a quality: neither quantity, nor relation, nor place, nor indeed any other category but that of quality, will be applicable properly to injustice. So it is with all other contraries falling under the category of quality.

Qualities admit of variation of degree. Whiteness is predicated of one thing in a greater or less degree than of another. This is

also the case with reference to justice. Moreover, one and the same thing may exhibit a quality in a greater degree than it did before: if a thing is white, it may become whiter.

Though this is generally the case, there are exceptions. For if we should say that justice admitted of variation of degree, difficulties might ensue, and this is true with regard to all those qualities which are dispositions. There are some, indeed, who dispute the possibility of variation here. They maintain that justice and health cannot very well admit of variation of degree themselves, but that people vary in the degree in which they possess these qualities, and that this is the case with grammatical learning and all those qualities which are classed as dispositions. However that may be, it is an incontrovertible fact that the things which in virtue of these qualities are said to be what they are vary in the degree in which they possess them; for one man is said to be better versed in grammar, or more healthy or just, than another, and so on.

The qualities expressed by the terms 'triangular' and 'quadrangular' do not appear to admit of variation of degree, nor indeed do any that have to do with figure. For those things to which the definition of the triangle or circle is applicable are all equally triangular or circular. Those, on the other hand, to which the same definition is not applicable, cannot be said to differ from one another in degree; the square is no more a circle than the rectangle, for to neither is the definition of the circle appropriate. In short, if the definition of the term proposed is not applicable to both objects, they cannot be compared. Thus it is not all qualities which admit of variation of degree.

Whereas none of the characteristics I have mentioned are peculiar to quality, the fact that likeness and unlikeness can be predicated with reference to quality only, gives to that category its distinctive feature. One thing is like another only with

reference to that in virtue of which it is such and such; thus this forms the peculiar mark of quality.

We must not be disturbed because it may be argued that, though proposing to discuss the category of quality, we have included in it many relative terms. We did say that habits and dispositions were relative. In practically all such cases the genus is relative, the individual not. Thus knowledge, as a genus, is explained by reference to something else, for we mean a knowledge of something. But particular branches of knowledge are not thus explained. The knowledge of grammar is not relative to anything external, nor is the knowledge of music, but these, if relative at all, are relative only in virtue of their genera; thus grammar is said be the knowledge of something, not the grammar of something; similarly music is the knowledge of something, not the music of something.

Thus individual branches of knowledge are not relative. And it is because we possess these individual branches of knowledge that we are said to be such and such. It is these that we actually possess: we are called experts because we possess knowledge in some particular branch. Those particular branches, therefore, of knowledge, in virtue of which we are sometimes said to be such and such, are themselves qualities, and are not relative. Further, if anything should happen to fall within both the category of quality and that of relation, there would be nothing extraordinary in classing it under both these heads.

9

Action and affection both admit of contraries and also of variation of degree. Heating is the contrary of cooling, being heated of being cooled, being glad of being vexed. Thus they

admit of contraries. They also admit of variation of degree: for it is possible to heat in a greater or less degree; also to be heated in a greater or less degree. Thus action and affection also admit of variation of degree. So much, then, is stated with regard to these categories.

We spoke, moreover, of the category of position when we were dealing with that of relation, and stated that such terms derived their names from those of the corresponding attitudes.

As for the rest, time, place, state, since they are easily intelligible, I say no more about them than was said at the beginning, that in the category of state are included such states as 'shod', 'armed', in that of place 'in the Lyceum' and so on, as was explained before.

10

The proposed categories have, then, been adequately dealt with.

We must next explain the various senses in which the term 'opposite' is used. Things are said to be opposed in four senses: (i) as correlatives to one another, (ii) as contraries to one another, (iii) as privatives to positives, (iv) as affirmatives to negatives.

Let me sketch my meaning in outline. An instance of the use of the word 'opposite' with reference to correlatives is afforded by the expressions 'double' and 'half'; with reference to contraries by 'bad' and 'good'. Opposites in the sense of 'privatives' and 'positives' are' blindness' and 'sight'; in the sense of affirmatives and negatives, the propositions 'he sits', 'he does not sit'.

(i) Pairs of opposites which fall under the category of relation are explained by a reference of the one to the other, the reference being indicated by the preposition 'of' or by some other preposition. Thus, double is a relative term, for that which is double is explained as the double of something. Knowledge, again, is the opposite of the thing known, in the same sense; and the thing known also is explained by its relation to its opposite, knowledge. For the thing known is explained as that which is known by something, that is, by knowledge. Such things, then, as are opposite the one to the other in the sense of being correlatives are explained by a reference of the one to the other.

(ii) Pairs of opposites which are contraries are not in any way interdependent, but are contrary the one to the other. The good is not spoken of as the good of the had, but as the contrary of the bad, nor is white spoken of as the white of the black, but as the contrary of the black. These two types of opposition are therefore distinct. Those contraries which are such that the subjects in which they are naturally present, or of which they are predicated, must necessarily contain either the one or the other of them, have no intermediate, but those in the case of which no such necessity obtains, always have an intermediate. Thus disease and health are naturally present in the body of an animal, and it is necessary that either the one or the other should be present in the body of an animal. Odd and even, again, are predicated of number, and it is necessary that the one or the other should be present in numbers. Now there is no intermediate between the terms of either of these two pairs. On the other hand, in those contraries with regard to which no such necessity obtains, we find an intermediate. Blackness and whiteness are naturally present in the body, but it is not necessary that either the one or the other should be present in the body, inasmuch as it is not true to say that everybody must be white or black. Badness and goodness, again, are predicated

of man, and of many other things, but it is not necessary that either the one quality or the other should be present in that of which they are predicated: it is not true to say that everything that may be good or bad must be either good or bad. These pairs of contraries have intermediates: the intermediates between white and black are grey, sallow, and all the other colours that come between; the intermediate between good and bad is that which is neither the one nor the other.

Some intermediate qualities have names, such as grey and sallow and all the other colours that come between white and black; in other cases, however, it is not easy to name the intermediate, but we must define it as that which is not either extreme, as in the case of that which is neither good nor bad, neither just nor unjust.

(iii) 'privatives' and 'Positives' have reference to the same subject. Thus, sight and blindness have reference to the eye. It is a universal rule that each of a pair of opposites of this type has reference to that to which the particular 'positive' is natural. We say that that is capable of some particular faculty or possession has suffered privation when the faculty or possession in question is in no way present in that in which, and at the time at which, it should naturally be present. We do not call that toothless which has not teeth, or that blind which has not sight, but rather that which has not teeth or sight at the time when by nature it should. For there are some creatures which from birth are without sight, or without teeth, but these are not called toothless or blind.

To be without some faculty or to possess it is not the same as the corresponding 'privative' or 'positive'. 'Sight' is a 'positive', 'blindness' a 'privative', but 'to possess sight' is not equivalent to 'sight', 'to be blind' is not equivalent to 'blindness'. Blindness is a 'privative', to be blind is to be in a state of privation, but is

not a ‘privative’. Moreover, if ‘blindness’ were equivalent to ‘being blind’, both would be predicated of the same subject; but though a man is said to be blind, he is by no means said to be blindness.

To be in a state of ‘possession’ is, it appears, the opposite of being in a state of ‘privation’, just as ‘positives’ and ‘privatives’ themselves are opposite. There is the same type of antithesis in both cases; for just as blindness is opposed to sight, so is being blind opposed to having sight.

That which is affirmed or denied is not itself affirmation or denial. By ‘affirmation’ we mean an affirmative proposition, by ‘denial’ a negative. Now, those facts which form the matter of the affirmation or denial are not propositions; yet these two are said to be opposed in the same sense as the affirmation and denial, for in this case also the type of antithesis is the same. For as the affirmation is opposed to the denial, as in the two propositions ‘he sits’, ‘he does not sit’, so also the fact which constitutes the matter of the proposition in one case is opposed to that in the other, his sitting, that is to say, to his not sitting.

It is evident that ‘positives’ and ‘privatives’ are not opposed each to each in the same sense as relatives. The one is not explained by reference to the other; sight is not sight of blindness, nor is any other preposition used to indicate the relation. Similarly blindness is not said to be blindness of sight, but rather, privation of sight. Relatives, moreover, reciprocate; if blindness, therefore, were a relative, there would be a reciprocity of relation between it and that with which it was correlative. But this is not the case. Sight is not called the sight of blindness.

That those terms which fall under the heads of ‘positives’ and ‘privatives’ are not opposed each to each as contraries, either, is plain from the following facts: Of a pair of contraries such that

they have no intermediate, one or the other must needs be present in the subject in which they naturally subsist, or of which they are predicated; for it is those, as we proved,' in the case of which this necessity obtains, that have no intermediate. Moreover, we cited health and disease, odd and even, as instances. But those contraries which have an intermediate are not subject to any such necessity. It is not necessary that every substance, receptive of such qualities, should be either black or white, cold or hot, for something intermediate between these contraries may very well be present in the subject. We proved, moreover, that those contraries have an intermediate in the case of which the said necessity does not obtain. Yet when one of the two contraries is a constitutive property of the subject, as it is a constitutive property of fire to be hot, of snow to be white, it is necessary determinately that one of the two contraries, not one or the other, should be present in the subject; for fire cannot be cold, or snow black. Thus, it is not the case here that one of the two must needs be present in every subject receptive of these qualities, but only in that subject of which the one forms a constitutive property. Moreover, in such cases it is one member of the pair determinately, and not either the one or the other, which must be present.

In the case of 'positives' and 'privatives', on the other hand, neither of the aforesaid statements holds good. For it is not necessary that a subject receptive of the qualities should always have either the one or the other; that which has not yet advanced to the state when sight is natural is not said either to be blind or to see. Thus 'positives' and 'privatives' do not belong to that class of contraries which consists of those which have no intermediate. On the other hand, they do not belong either to that class which consists of contraries which have an intermediate. For under certain conditions it is necessary that either the one or the other should form part of the constitution of every appropriate subject. For when a thing has reached the

stage when it is by nature capable of sight, it will be said either to see or to be blind, and that in an indeterminate sense, signifying that the capacity may be either present or absent; for it is not necessary either that it should see or that it should be blind, but that it should be either in the one state or in the other. Yet in the case of those contraries which have an intermediate we found that it was never necessary that either the one or the other should be present in every appropriate subject, but only that in certain subjects one of the pair should be present, and that in a determinate sense. It is, therefore, plain that 'positives' and 'privatives' are not opposed each to each in either of the senses in which contraries are opposed.

Again, in the case of contraries, it is possible that there should be changes from either into the other, while the subject retains its identity, unless indeed one of the contraries is a constitutive property of that subject, as heat is of fire. For it is possible that that that which is healthy should become diseased, that which is white, black, that which is cold, hot, that which is good, bad, that which is bad, good. The bad man, if he is being brought into a better way of life and thought, may make some advance, however slight, and if he should once improve, even ever so little, it is plain that he might change completely, or at any rate make very great progress; for a man becomes more and more easily moved to virtue, however small the improvement was at first. It is, therefore, natural to suppose that he will make yet greater progress than he has made in the past; and as this process goes on, it will change him completely and establish him in the contrary state, provided he is not hindered by lack of time. In the case of 'positives' and 'privatives', however, change in both directions is impossible. There may be a change from possession to privation, but not from privation to possession. The man who has become blind does not regain his sight; the man who has become bald does not regain his hair; the man who has lost his teeth does not grow his grow a new set.

(iv) Statements opposed as affirmation and negation belong manifestly to a class which is distinct, for in this case, and in this case only, it is necessary for the one opposite to be true and the other false.

Neither in the case of contraries, nor in the case of correlatives, nor in the case of 'positives' and 'privatives', is it necessary for one to be true and the other false. Health and disease are contraries: neither of them is true or false. 'Double' and 'half' are opposed to each other as correlatives: neither of them is true or false. The case is the same, of course, with regard to 'positives' and 'privatives' such as 'sight' and 'blindness'. In short, where there is no sort of combination of words, truth and falsity have no place, and all the opposites we have mentioned so far consist of simple words.

At the same time, when the words which enter into opposed statements are contraries, these, more than any other set of opposites, would seem to claim this characteristic. 'Socrates is ill' is the contrary of 'Socrates is well', but not even of such composite expressions is it true to say that one of the pair must always be true and the other false. For if Socrates exists, one will be true and the other false, but if he does not exist, both will be false; for neither 'Socrates is ill' nor 'Socrates is well' is true, if Socrates does not exist at all.

In the case of 'positives' and 'privatives', if the subject does not exist at all, neither proposition is true, but even if the subject exists, it is not always the fact that one is true and the other false. For 'Socrates has sight' is the opposite of 'Socrates is blind' in the sense of the word 'opposite' which applies to possession and privation. Now if Socrates exists, it is not necessary that one should be true and the other false, for when he is not yet able to acquire the power of vision, both are false, as also if Socrates is altogether non-existent.

But in the case of affirmation and negation, whether the subject exists or not, one is always false and the other true. For manifestly, if Socrates exists, one of the two propositions 'Socrates is ill', 'Socrates is not ill', is true, and the other false. This is likewise the case if he does not exist; for if he does not exist, to say that he is ill is false, to say that he is not ill is true. Thus it is in the case of those opposites only, which are opposite in the sense in which the term is used with reference to affirmation and negation, that the rule holds good, that one of the pair must be true and the other false.

11

That the contrary of a good is an evil is shown by induction: the contrary of health is disease, of courage, cowardice, and so on. But the contrary of an evil is sometimes a good, sometimes an evil. For defect, which is an evil, has excess for its contrary, this also being an evil, and the mean. which is a good, is equally the contrary of the one and of the other. It is only in a few cases, however, that we see instances of this: in most, the contrary of an evil is a good.

In the case of contraries, it is not always necessary that if one exists the other should also exist: for if all become healthy there will be health and no disease, and again, if everything turns white, there will be white, but no black. Again, since the fact that Socrates is ill is the contrary of the fact that Socrates is well, and two contrary conditions cannot both obtain in one and the same individual at the same time, both these contraries could not exist at once: for if that Socrates was well was a fact, then that Socrates was ill could not possibly be one.

It is plain that contrary attributes must needs be present in subjects which belong to the same species or genus. Disease and health require as their subject the body of an animal; white and black require a body, without further qualification; justice and injustice require as their subject the human soul.

Moreover, it is necessary that pairs of contraries should in all cases either belong to the same genus or belong to contrary genera or be themselves genera. White and black belong to the same genus, colour; justice and injustice, to contrary genera, virtue and vice; while good and evil do not belong to genera, but are themselves actual genera, with terms under them.

12

There are four senses in which one thing can be said to be 'prior' to another. Primarily and most properly the term has reference to time: in this sense the word is used to indicate that one thing is older or more ancient than another, for the expressions 'older' and 'more ancient' imply greater length of time.

Secondly, one thing is said to be 'prior' to another when the sequence of their being cannot be reversed. In this sense 'one' is 'prior' to 'two'. For if 'two' exists, it follows directly that 'one' must exist, but if 'one' exists, it does not follow necessarily that 'two' exists: thus the sequence subsisting cannot be reversed. It is agreed, then, that when the sequence of two things cannot be reversed, then that one on which the other depends is called 'prior' to that other.

In the third place, the term 'prior' is used with reference to any order, as in the case of science and of oratory. For in sciences

which use demonstration there is that which is prior and that which is posterior in order; in geometry, the elements are prior to the propositions; in reading and writing, the letters of the alphabet are prior to the syllables. Similarly, in the case of speeches, the exordium is prior in order to the narrative.

Besides these senses of the word, there is a fourth. That which is better and more honourable is said to have a natural priority. In common parlance men speak of those whom they honour and love as ‘coming first’ with them. This sense of the word is perhaps the most far-fetched.

Such, then, are the different senses in which the term ‘prior’ is used.

Yet it would seem that besides those mentioned there is yet another. For in those things, the being of each of which implies that of the other, that which is in any way the cause may reasonably be said to be by nature ‘prior’ to the effect. It is plain that there are instances of this. The fact of the being of a man carries with it the truth of the proposition that he is, and the implication is reciprocal: for if a man is, the proposition wherein we allege that he is true, and conversely, if the proposition wherein we allege that he is true, then he is. The true proposition, however, is in no way the cause of the being of the man, but the fact of the man’s being does seem somehow to be the cause of the truth of the proposition, for the truth or falsity of the proposition depends on the fact of the man’s being or not being.

Thus the word ‘prior’ may be used in five senses.

13

The term 'simultaneous' is primarily and most appropriately applied to those things the genesis of the one of which is simultaneous with that of the other; for in such cases neither is prior or posterior to the other. Such things are said to be simultaneous in point of time. Those things, again, are 'simultaneous' in point of nature, the being of each of which involves that of the other, while at the same time neither is the cause of the other's being. This is the case with regard to the double and the half, for these are reciprocally dependent, since, if there is a double, there is also a half, and if there is a half, there is also a double, while at the same time neither is the cause of the being of the other.

Again, those species which are distinguished one from another and opposed one to another within the same genus are said to be 'simultaneous' in nature. I mean those species which are distinguished each from each by one and the same method of division. Thus the 'winged' species is simultaneous with the 'terrestrial' and the 'water' species. These are distinguished within the same genus, and are opposed each to each, for the genus 'animal' has the 'winged', the 'terrestrial', and the 'water' species, and no one of these is prior or posterior to another; on the contrary, all such things appear to be 'simultaneous' in nature. Each of these also, the terrestrial, the winged, and the water species, can be divided again into subspecies. Those species, then, also will be 'simultaneous' point of nature, which, belonging to the same genus, are distinguished each from each by one and the same method of differentiation.

But genera are prior to species, for the sequence of their being cannot be reversed. If there is the species 'water-animal', there will be the genus 'animal', but granted the being of the genus

‘animal’, it does not follow necessarily that there will be the species ‘water-animal’.

Those things, therefore, are said to be ‘simultaneous’ in nature, the being of each of which involves that of the other, while at the same time neither is in any way the cause of the other’s being; those species, also, which are distinguished each from each and opposed within the same genus. Those things, moreover, are ‘simultaneous’ in the unqualified sense of the word which come into being at the same time.

14

There are six sorts of movement: generation, destruction, increase, diminution, alteration, and change of place.

It is evident in all but one case that all these sorts of movement are distinct each from each. Generation is distinct from destruction, increase and change of place from diminution, and so on. But in the case of alteration it may be argued that the process necessarily implies one or other of the other five sorts of motion. This is not true, for we may say that all affections, or nearly all, produce in us an alteration which is distinct from all other sorts of motion, for that which is affected need not suffer either increase or diminution or any of the other sorts of motion. Thus alteration is a distinct sort of motion; for, if it were not, the thing altered would not only be altered, but would forthwith necessarily suffer increase or diminution or some one of the other sorts of motion in addition; which as a matter of fact is not the case. Similarly that which was undergoing the process of increase or was subject to some other sort of motion would, if alteration were not a distinct form of motion, necessarily be subject to alteration also. But there are some

things which undergo increase but yet not alteration. The square, for instance, if a gnomon is applied to it, undergoes increase but not alteration, and so it is with all other figures of this sort. Alteration and increase, therefore, are distinct.

Speaking generally, rest is the contrary of motion. But the different forms of motion have their own contraries in other forms; thus destruction is the contrary of generation, diminution of increase, rest in a place, of change of place. As for this last, change in the reverse direction would seem to be most truly its contrary; thus motion upwards is the contrary of motion downwards and vice versa.

In the case of that sort of motion which yet remains, of those that have been enumerated, it is not easy to state what is its contrary. It appears to have no contrary, unless one should define the contrary here also either as 'rest in its quality' or as 'change in the direction of the contrary quality', just as we defined the contrary of change of place either as rest in a place or as change in the reverse direction. For a thing is altered when change of quality takes place; therefore either rest in its quality or change in the direction of the contrary may be called the contrary of this qualitative form of motion. In this way becoming white is the contrary of becoming black; there is alteration in the contrary direction, since a change of a qualitative nature takes place.

15

The term 'to have' is used in various senses. In the first place it is used with reference to habit or disposition or any other quality, for we are said to 'have' a piece of knowledge or a virtue. Then, again, it has reference to quantity, as, for instance, in the

case of a man's height; for he is said to 'have' a height of three or four cubits. It is used, moreover, with regard to apparel, a man being said to 'have' a coat or tunic; or in respect of something which we have on a part of ourselves, as a ring on the hand: or in respect of something which is a part of us, as hand or foot. The term refers also to content, as in the case of a vessel and wheat, or of a jar and wine; a jar is said to 'have' wine, and a corn-measure wheat. The expression in such cases has reference to content. Or it refers to that which has been acquired; we are said to 'have' a house or a field. A man is also said to 'have' a wife, and a wife a husband, and this appears to be the most remote meaning of the term, for by the use of it we mean simply that the husband lives with the wife.

Other senses of the word might perhaps be found, but the most ordinary ones have all been enumerated.

Aristotle - On Interpretation

[Translated by E. M. Edghill]

1

First we must define the terms ‘noun’ and ‘verb’, then the terms ‘denial’ and ‘affirmation’, then ‘proposition’ and ‘sentence.’

Spoken words are the symbols of mental experience and written words are the symbols of spoken words. Just as all men have not the same writing, so all men have not the same speech sounds, but the mental experiences, which these directly symbolize, are the same for all, as also are those things of which our experiences are the images. This matter has, however, been discussed in my treatise about the soul, for it belongs to an investigation distinct from that which lies before us.

As there are in the mind thoughts which do not involve truth or falsity, and also those which must be either true or false, so it is in speech. For truth and falsity imply combination and separation. Nouns and verbs, provided nothing is added, are like thoughts without combination or separation; ‘man’ and ‘white’, as isolated terms, are not yet either true or false. In proof of this, consider the word ‘goat-stag.’ It has significance, but there is no truth or falsity about it, unless ‘is’ or ‘is not’ is added, either in the present or in some other tense.

2

By a noun we mean a sound significant by convention, which has no reference to time, and of which no part is significant apart from the rest. In the noun 'Fairsteed,' the part 'steed' has no significance in and by itself, as in the phrase 'fair steed.' Yet there is a difference between simple and composite nouns; for in the former the part is in no way significant, in the latter it contributes to the meaning of the whole, although it has not an independent meaning. Thus in the word 'pirate-boat' the word 'boat' has no meaning except as part of the whole word.

The limitation 'by convention' was introduced because nothing is by nature a noun or name – it is only so when it becomes a symbol; inarticulate sounds, such as those which brutes produce, are significant, yet none of these constitutes a noun.

The expression 'not-man' is not a noun. There is indeed no recognized term by which we may denote such an expression, for it is not a sentence or a denial. Let it then be called an indefinite noun.

The expressions 'of Philo', 'to Philo', and so on, constitute not nouns, but cases of a noun. The definition of these cases of a noun is in other respects the same as that of the noun proper, but, when coupled with 'is', 'was', or will be', they do not, as they are, form a proposition either true or false, and this the noun proper always does, under these conditions. Take the words 'of Philo is' or 'of or 'of Philo is not'; these words do not, as they stand, form either a true or a false proposition.

3

A verb is that which, in addition to its proper meaning, carries with it the notion of time. No part of it has any independent meaning, and it is a sign of something said of something else.

I will explain what I mean by saying that it carries with it the notion of time. ‘Health’ is a noun, but ‘is healthy’ is a verb; for besides its proper meaning it indicates the present existence of the state in question.

Moreover, a verb is always a sign of something said of something else, i.e. of something either predicable of or present in some other thing.

Such expressions as ‘is not-healthy’, ‘is not, ill’, I do not describe as verbs; for though they carry the additional note of time, and always form a predicate, there is no specified name for this variety; but let them be called indefinite verbs, since they apply equally well to that which exists and to that which does not.

Similarly ‘he was healthy’, ‘he will be healthy’, are not verbs, but tenses of a verb; the difference lies in the fact that the verb indicates present time, while the tenses of the verb indicate those times which lie outside the present.

Verbs in and by themselves are substantival and have significance, for he who uses such expressions arrests the hearer’s mind, and fixes his attention; but they do not, as they stand, express any judgement, either positive or negative. For neither are ‘to be’ and ‘not to be’ the participle ‘being’ significant of any fact, unless something is added; for they do not themselves indicate anything, but imply a copulation, of which we cannot form a conception apart from the things coupled.

4

A sentence is a significant portion of speech, some parts of which have an independent meaning, that is to say, as an utterance, though not as the expression of any positive judgement. Let me explain. The word 'human' has meaning, but does not constitute a proposition, either positive or negative. It is only when other words are added that the whole will form an affirmation or denial. But if we separate one syllable of the word 'human' from the other, it has no meaning; similarly in the word 'mouse', the part 'ouse' has no meaning in itself, but is merely a sound. In composite words, indeed, the parts contribute to the meaning of the whole; yet, as has been pointed out, they have not an independent meaning.

Every sentence has meaning, not as being the natural means by which a physical faculty is realized, but, as we have said, by convention. Yet every sentence is not a proposition; only such are propositions as have in them either truth or falsity. Thus a prayer is a sentence, but is neither true nor false.

Let us therefore dismiss all other types of sentence but the proposition, for this last concerns our present inquiry, whereas the investigation of the others belongs rather to the study of rhetoric or of poetry.

5

The first class of simple propositions is the simple affirmation, the next, the simple denial; all others are only one by conjunction.

Every proposition must contain a verb or the tense of a verb. The phrase which defines the species 'man', if no verb in present, past, or future time be added, is not a proposition. It may be asked how the expression 'a footed animal with two feet' can be called single; for it is not the circumstance that the words follow in unbroken succession that effects the unity. This inquiry, however, finds its place in an investigation foreign to that before us.

We call those propositions single which indicate a single fact, or the conjunction of the parts of which results in unity: those propositions, on the other hand, are separate and many in number, which indicate many facts, or whose parts have no conjunction.

Let us, moreover, consent to call a noun or a verb an expression only, and not a proposition, since it is not possible for a man to speak in this way when he is expressing something, in such a way as to make a statement, whether his utterance is an answer to a question or an act of his own initiation.

To return: of propositions one kind is simple, i.e. that which asserts or denies something of something, the other composite, i.e. that which is compounded of simple propositions. A simple proposition is a statement, with meaning, as to the presence of something in a subject or its absence, in the present, past, or future, according to the divisions of time.

6

An affirmation is a positive assertion of something about something, a denial a negative assertion.

Now it is possible both to affirm and to deny the presence of something which is present or of something which is not, and since these same affirmations and denials are possible with reference to those times which lie outside the present, it would be possible to contradict any affirmation or denial. Thus it is plain that every affirmation has an opposite denial, and similarly every denial an opposite affirmation.

We will call such a pair of propositions a pair of contradictories. Those positive and negative propositions are said to be contradictory which have the same subject and predicate. The identity of subject and of predicate must not be 'equivocal'. Indeed there are definitive qualifications besides this, which we make to meet the casuistries of sophists.

7

Some things are universal, others individual. By the term 'universal' I mean that which is of such a nature as to be predicated of many subjects, by 'individual' that which is not thus predicated. Thus 'man' is a universal, 'Callias' an individual.

Our propositions necessarily sometimes concern a universal subject, sometimes an individual.

If, then, a man states a positive and a negative proposition of universal character with regard to a universal, these two propositions are 'contrary'. By the expression 'a proposition of

universal character with regard to a universal', such propositions as 'every man is white', 'no man is white' are meant. When, on the other hand, the positive and negative propositions, though they have regard to a universal, are yet not of universal character, they will not be contrary, albeit the meaning intended is sometimes contrary. As instances of propositions made with regard to a universal, but not of universal character, we may take the 'propositions 'man is white', 'man is not white'. 'Man' is a universal, but the proposition is not made as of universal character; for the word 'every' does not make the subject a universal, but rather gives the proposition a universal character. If, however, both predicate and subject are distributed, the proposition thus constituted is contrary to truth; no affirmation will, under such circumstances, be true. The proposition 'every man is every animal' is an example of this type.

An affirmation is opposed to a denial in the sense which I denote by the term 'contradictory', when, while the subject remains the same, the affirmation is of universal character and the denial is not. The affirmation 'every man is white' is the contradictory of the denial 'not every man is white', or again, the proposition 'no man is white' is the contradictory of the proposition 'some men are white'. But propositions are opposed as contraries when both the affirmation and the denial are universal, as in the sentences 'every man is white', 'no man is white', 'every man is just', 'no man is just'.

We see that in a pair of this sort both propositions cannot be true, but the contradictories of a pair of contraries can sometimes both be true with reference to the same subject; for instance 'not every man is white' and some men are white' are both true. Of such corresponding positive and negative propositions as refer to universals and have a universal character, one must be true and the other false. This is the case

also when the reference is to individuals, as in the propositions 'Socrates is white', 'Socrates is not white'.

When, on the other hand, the reference is to universals, but the propositions are not universal, it is not always the case that one is true and the other false, for it is possible to state truly that man is white and that man is not white and that man is beautiful and that man is not beautiful; for if a man is deformed he is the reverse of beautiful, also if he is progressing towards beauty he is not yet beautiful.

This statement might seem at first sight to carry with it a contradiction, owing to the fact that the proposition 'man is not white' appears to be equivalent to the proposition 'no man is white'. This, however, is not the case, nor are they necessarily at the same time true or false.

It is evident also that the denial corresponding to a single affirmation is itself single; for the denial must deny just that which the affirmation affirms concerning the same subject, and must correspond with the affirmation both in the universal or particular character of the subject and in the distributed or undistributed sense in which it is understood.

For instance, the affirmation 'Socrates is white' has its proper denial in the proposition 'Socrates is not white'. If anything else be negatively predicated of the subject or if anything else be the subject though the predicate remain the same, the denial will not be the denial proper to that affirmation, but on that is distinct.

The denial proper to the affirmation 'every man is white' is 'not every man is white'; that proper to the affirmation 'some men are white' is 'no man is white', while that proper to the affirmation 'man is white' is 'man is not white'.

We have shown further that a single denial is contradictorily opposite to a single affirmation and we have explained which these are; we have also stated that contrary are distinct from contradictory propositions and which the contrary are; also that with regard to a pair of opposite propositions it is not always the case that one is true and the other false. We have pointed out, moreover, what the reason of this is and under what circumstances the truth of the one involves the falsity of the other.

8

An affirmation or denial is single, if it indicates some one fact about some one subject; it matters not whether the subject is universal and whether the statement has a universal character, or whether this is not so. Such single propositions are: 'every man is white', 'not every man is white';'man is white','man is not white'; 'no man is white', 'some men are white'; provided the word 'white' has one meaning. If, on the other hand, one word has two meanings which do not combine to form one, the affirmation is not single. For instance, if a man should establish the symbol 'garment' as significant both of a horse and of a man, the proposition 'garment is white' would not be a single affirmation, nor its opposite a single denial. For it is equivalent to the proposition 'horse and man are white', which, again, is equivalent to the two propositions 'horse is white', 'man is white'. If, then, these two propositions have more than a single significance, and do not form a single proposition, it is plain that the first proposition either has more than one significance or else has none; for a particular man is not a horse.

This, then, is another instance of those propositions of which both the positive and the negative forms may be true or false simultaneously.

9

In the case of that which is or which has taken place, propositions, whether positive or negative, must be true or false. Again, in the case of a pair of contradictories, either when the subject is universal and the propositions are of a universal character, or when it is individual, as has been said,' one of the two must be true and the other false; whereas when the subject is universal, but the propositions are not of a universal character, there is no such necessity. We have discussed this type also in a previous chapter.

When the subject, however, is individual, and that which is predicated of it relates to the future, the case is altered. For if all propositions whether positive or negative are either true or false, then any given predicate must either belong to the subject or not, so that if one man affirms that an event of a given character will take place and another denies it, it is plain that the statement of the one will correspond with reality and that of the other will not. For the predicate cannot both belong and not belong to the subject at one and the same time with regard to the future.

Thus, if it is true to say that a thing is white, it must necessarily be white; if the reverse proposition is true, it will of necessity not be white. Again, if it is white, the proposition stating that it is white was true; if it is not white, the proposition to the opposite effect was true. And if it is not white, the man who states that it is making a false statement; and if the man who

states that it is white is making a false statement, it follows that it is not white. It may therefore be argued that it is necessary that affirmations or denials must be either true or false.

Now if this be so, nothing is or takes place fortuitously, either in the present or in the future, and there are no real alternatives; everything takes place of necessity and is fixed. For either he that affirms that it will take place or he that denies this is in correspondence with fact, whereas if things did not take place of necessity, an event might just as easily not happen as happen; for the meaning of the word 'fortuitous' with regard to present or future events is that reality is so constituted that it may issue in either of two opposite directions. Again, if a thing is white now, it was true before to say that it would be white, so that of anything that has taken place it was always true to say 'it is' or 'it will be'. But if it was always true to say that a thing is or will be, it is not possible that it should not be or not be about to be, and when a thing cannot not come to be, it is impossible that it should not come to be, and when it is impossible that it should not come to be, it must come to be. All, then, that is about to be must of necessity take place. It results from this that nothing is uncertain or fortuitous, for if it were fortuitous it would not be necessary.

Again, to say that neither the affirmation nor the denial is true, maintaining, let us say, that an event neither will take place nor will not take place, is to take up a position impossible to defend. In the first place, though facts should prove the one proposition false, the opposite would still be untrue. Secondly, if it was true to say that a thing was both white and large, both these qualities must necessarily belong to it; and if they will belong to it the next day, they must necessarily belong to it the next day. But if an event is neither to take place nor not to take place the next day, the element of chance will be eliminated. For

example, it would be necessary that a sea-fight should neither take place nor fail to take place on the next day.

These awkward results and others of the same kind follow, if it is an irrefragable law that of every pair of contradictory propositions, whether they have regard to universals and are stated as universally applicable, or whether they have regard to individuals, one must be true and the other false, and that there are no real alternatives, but that all that is or takes place is the outcome of necessity. There would be no need to deliberate or to take trouble, on the supposition that if we should adopt a certain course, a certain result would follow, while, if we did not, the result would not follow. For a man may predict an event ten thousand years beforehand, and another may predict the reverse; that which was truly predicted at the moment in the past will of necessity take place in the fullness of time.

Further, it makes no difference whether people have or have not actually made the contradictory statements. For it is manifest that the circumstances are not influenced by the fact of an affirmation or denial on the part of anyone. For events will not take place or fail to take place because it was stated that they would or would not take place, nor is this any more the case if the prediction dates back ten thousand years or any other space of time. Wherefore, if through all time the nature of things was so constituted that a prediction about an event was true, then through all time it was necessary that that should find fulfillment; and with regard to all events, circumstances have always been such that their occurrence is a matter of necessity. For that of which someone has said truly that it will be, cannot fail to take place; and of that which takes place, it was always true to say that it would be.

Yet this view leads to an impossible conclusion; for we see that both deliberation and action are causative with regard to the

future, and that, to speak more generally, in those things which are not continuously actual there is potentiality in either direction. Such things may either be or not be; events also therefore may either take place or not take place. There are many obvious instances of this. It is possible that this coat may be cut in half, and yet it may not be cut in half, but wear out first. In the same way, it is possible that it should not be cut in half; unless this were so, it would not be possible that it should wear out first. So it is therefore with all other events which possess this kind of potentiality. It is therefore plain that it is not of necessity that everything is or takes place; but in some instances there are real alternatives, in which case the affirmation is no more true and no more false than the denial; while some exhibit a predisposition and general tendency in one direction or the other, and yet can issue in the opposite direction by exception.

Now that which is must needs be when it is, and that which is not must needs not be when it is not. Yet it cannot be said without qualification that all existence and non-existence is the outcome of necessity. For there is a difference between saying that that which is, when it is, must needs be, and simply saying that all that is must needs be, and similarly in the case of that which is not. In the case, also, of two contradictory propositions this holds good. Everything must either be or not be, whether in the present or in the future, but it is not always possible to distinguish and state determinately which of these alternatives must necessarily come about.

Let me illustrate. A sea-fight must either take place to-morrow or not, but it is not necessary that it should take place to-morrow, neither is it necessary that it should not take place, yet it is necessary that it either should or should not take place to-morrow. Since propositions correspond with facts, it is evident that when in future events there is a real alternative, and a

potentiality in contrary directions, the corresponding affirmation and denial have the same character.

This is the case with regard to that which is not always existent or not always nonexistent. One of the two propositions in such instances must be true and the other false, but we cannot say determinately that this or that is false, but must leave the alternative undecided. One may indeed be more likely to be true than the other, but it cannot be either actually true or actually false. It is therefore plain that it is not necessary that of an affirmation and a denial one should be true and the other false. For in the case of that which exists potentially, but not actually, the rule which applies to that which exists actually does not hold good. The case is rather as we have indicated.

10

An affirmation is the statement of a fact with regard to a subject, and this subject is either a noun or that which has no name; the subject and predicate in an affirmation must each denote a single thing. I have already explained' what is meant by a noun and by that which has no name; for I stated that the expression 'not-man' was not a noun, in the proper sense of the word, but an indefinite noun, denoting as it does in a certain sense a single thing. Similarly the expression 'does not enjoy health' is not a verb proper, but an indefinite verb. Every affirmation, then, and every denial, will consist of a noun and a verb, either definite or indefinite.

There can be no affirmation or denial without a verb; for the expressions 'is', 'will be', 'was', 'is coming to be', and the like are verbs according to our definition, since besides their specific meaning they convey the notion of time. Thus the primary

affirmation and denial are ‘as follows: ‘man is’, ‘man is not’. Next to these, there are the propositions: ‘not-man is’, ‘not-man is not’. Again we have the propositions: ‘every man is, ‘every man is not’, ‘all that is not-man is’, ‘all that is not-man is not’. The same classification holds good with regard to such periods of time as lie outside the present.

When the verb ‘is’ is used as a third element in the sentence, there can be positive and negative propositions of two sorts. Thus in the sentence ‘man is just’ the verb ‘is’ is used as a third element, call it verb or noun, which you will. Four propositions, therefore, instead of two can be formed with these materials. Two of the four, as regards their affirmation and denial, correspond in their logical sequence with the propositions which deal with a condition of privation; the other two do not correspond with these.

I mean that the verb ‘is’ is added either to the term ‘just’ or to the term ‘not-just’, and two negative propositions are formed in the same way. Thus we have the four propositions. Reference to the subjoined table will make matters clear:

A. Affirmation	B. Denial
Man is just	Man is not just
D. Denial	C. Affirmation
Man is not not-just	Man is not-just

Here 'is' and 'is not' are added either to 'just' or to 'not-just'.

This then is the proper scheme for these propositions, as has been said in the Analytics. The same rule holds good, if the subject is distributed. Thus we have the table:

A'. Affirmation	B'. Denial
Every man is just	Not every man is just
D'. Denial	C'. Affirmation
Not every man is not-just	Every man is not-just

Yet here it is not possible, in the same way as in the former case, that the propositions joined in the table by a diagonal line should both be true; though under certain circumstances this is the case.

We have thus set out two pairs of opposite propositions; there are moreover two other pairs, if a term be conjoined with 'not-man', the latter forming a kind of subject. Thus:

A". Not-man is just	B". Not-man is not just
D". Not-man is not not-just	C". Not-man is not-just

This is an exhaustive enumeration of all the pairs of opposite propositions that can possibly be framed. This last group should remain distinct from those which preceded it, since it employs as its subject the expression 'not-man'.

When the verb 'is' does not fit the structure of the sentence (for instance, when the verbs 'walks', 'enjoys health' are used), that scheme applies, which applied when the word 'is' was added.

Thus we have the propositions: 'every man enjoys health', 'every man does-not-enjoy-health', 'all that is not-man enjoys health', 'all that is not-man does-not-enjoy-health'. We must not in these propositions use the expression 'not every man'. The negative must be attached to the word 'man', for the word 'every' does not give to the subject a universal significance, but implies that, as a subject, it is distributed. This is plain from the following pairs: 'man enjoys health', 'man does not enjoy health'; 'not-man enjoys health', 'not man does not enjoy health'. These propositions differ from the former in being indefinite and not universal in character. Thus the adjectives 'every' and no additional significance except that the subject, whether in a positive or in a negative sentence, is distributed. The rest of the sentence, therefore, will in each case be the same.

Since the contrary of the proposition 'every animal is just' is 'no animal is just', it is plain that these two propositions will never both be true at the same time or with reference to the same subject. Sometimes, however, the contradictories of these contraries will both be true, as in the instance before us: the propositions 'not every animal is just' and 'some animals are just' are both true.

Further, the proposition 'no man is just' follows from the proposition 'every man is not just' and the proposition 'not every man is not just', which is the opposite of 'every man is not-just', follows from the proposition 'some men are just'; for if this be true, there must be some just men.

It is evident, also, that when the subject is individual, if a question is asked and the negative answer is the true one, a certain positive proposition is also true. Thus, if the question were asked Socrates wise?' and the negative answer were the true one, the positive inference 'Then Socrates is unwise' is correct. But no such inference is correct in the case of universals, but rather a negative proposition. For instance, if to the question 'Is every man wise?' the answer is 'no', the inference 'Then every man is unwise' is false. But under these circumstances the inference 'Not every man is wise' is correct. This last is the contradictory, the former the contrary. Negative expressions, which consist of an indefinite noun or predicate, such as 'not-man' or 'not-just', may seem to be denials containing neither noun nor verb in the proper sense of the words. But they are not. For a denial must always be either true or false, and he that uses the expression 'not man', if nothing more be added, is not nearer but rather further from making a true or a false statement than he who uses the expression 'man'.

The propositions 'everything that is not man is just', and the contradictory of this, are not equivalent to any of the other propositions; on the other hand, the proposition 'everything that is not man is not just' is equivalent to the proposition 'nothing that is not man is just'.

The conversion of the position of subject and predicate in a sentence involves no difference in its meaning. Thus we say 'man is white' and 'white is man'. If these were not equivalent,

there would be more than one contradictory to the same proposition, whereas it has been demonstrated' that each proposition has one proper contradictory and one only. For of the proposition 'man is white' the appropriate contradictory is 'man is not white', and of the proposition 'white is man', if its meaning be different, the contradictory will either be 'white is not not-man' or 'white is not man'. Now the former of these is the contradictory of the proposition 'white is not-man', and the latter of these is the contradictory of the proposition 'man is white'; thus there will be two contradictories to one proposition.

It is evident, therefore, that the inversion of the relative position of subject and predicate does not affect the sense of affirmations and denials.

11

There is no unity about an affirmation or denial which, either positively or negatively, predicates one thing of many subjects, or many things of the same subject, unless that which is indicated by the many is really some one thing. do not apply this word 'one' to those things which, though they have a single recognized name, yet do not combine to form a unity. Thus, man may be an animal, and biped, and domesticated, but these three predicates combine to form a unity. On the other hand, the predicates 'white', 'man', and 'walking' do not thus combine. Neither, therefore, if these three form the subject of an affirmation, nor if they form its predicate, is there any unity about that affirmation. In both cases the unity is linguistic, but not real.

If therefore the dialectical question is a request for an answer, i.e. either for the admission of a premiss or for the admission of one of two contradictories – and the premiss is itself always one of two contradictories – the answer to such a question as contains the above predicates cannot be a single proposition. For as I have explained in the Topics, question is not a single one, even if the answer asked for is true.

At the same time it is plain that a question of the form 'what is it?' is not a dialectical question, for a dialectical questioner must by the form of his question give his opponent the chance of announcing one of two alternatives, whichever he wishes. He must therefore put the question into a more definite form, and inquire, e.g.. whether man has such and such a characteristic or not.

Some combinations of predicates are such that the separate predicates unite to form a single predicate. Let us consider under what conditions this is and is not possible. We may either state in two separate propositions that man is an animal and that man is a biped, or we may combine the two, and state that man is an animal with two feet. Similarly we may use 'man' and 'white' as separate predicates, or unite them into one. Yet if a man is a shoemaker and is also good, we cannot construct a composite proposition and say that he is a good shoemaker. For if, whenever two separate predicates truly belong to a subject, it follows that the predicate resulting from their combination also truly belongs to the subject, many absurd results ensue. For instance, a man is man and white. Therefore, if predicates may always be combined, he is a white man. Again, if the predicate 'white' belongs to him, then the combination of that predicate with the former composite predicate will be permissible. Thus it will be right to say that he is a white man so on indefinitely. Or, again, we may combine the predicates 'musical', 'white', and 'walking', and these may

be combined many times. Similarly we may say that Socrates is Socrates and a man, and that therefore he is the man Socrates, or that Socrates is a man and a biped, and that therefore he is a two-footed man. Thus it is manifest that if man states unconditionally that predicates can always be combined, many absurd consequences ensue.

We will now explain what ought to be laid down.

Those predicates, and terms forming the subject of predication, which are accidental either to the same subject or to one another, do not combine to form a unity. Take the proposition 'man is white of complexion and musical'. Whiteness and being musical do not coalesce to form a unity, for they belong only accidentally to the same subject. Nor yet, if it were true to say that that which is white is musical, would the terms 'musical' and 'white' form a unity, for it is only incidentally that that which is musical is white; the combination of the two will, therefore, not form a unity.

Thus, again, whereas, if a man is both good and a shoemaker, we cannot combine the two propositions and say simply that he is a good shoemaker, we are, at the same time, able to combine the predicates 'animal' and 'biped' and say that a man is an animal with two feet, for these predicates are not accidental.

Those predicates, again, cannot form a unity, of which the one is implicit in the other: thus we cannot combine the predicate 'white' again and again with that which already contains the notion 'white', nor is it right to call a man an animal-man or a two-footed man; for the notions 'animal' and 'biped' are implicit in the word 'man'. On the other hand, it is possible to predicate a term simply of any one instance, and to say that some one particular man is a man or that some one white man is a white man.

Yet this is not always possible: indeed, when in the adjunct there is some opposite which involves a contradiction, the predication of the simple term is impossible. Thus it is not right to call a dead man a man. When, however, this is not the case, it is not impossible.

Yet the facts of the case might rather be stated thus: when some such opposite elements are present, resolution is never possible, but when they are not present, resolution is nevertheless not always possible. Take the proposition 'Homer is so-and-so', say 'a poet'; does it follow that Homer is, or does it not? The verb 'is' is here used of Homer only incidentally, the proposition being that Homer is a poet, not that he is, in the independent sense of the word.

Thus, in the case of those predications which have within them no contradiction when the nouns are expanded into definitions, and wherein the predicates belong to the subject in their own proper sense and not in any indirect way, the individual may be the subject of the simple propositions as well as of the composite. But in the case of that which is not, it is not true to say that because it is the object of opinion, it is; for the opinion held about it is that it is not, not that it is.

12

As these distinctions have been made, we must consider the mutual relation of those affirmations and denials which assert or deny possibility or contingency, impossibility or necessity: for the subject is not without difficulty.

We admit that of composite expressions those are contradictory each to each which have the verb 'to be' its positive and

negative form respectively. Thus the contradictory of the proposition ‘man is’ is ‘man is not’, not ‘not-man is’, and the contradictory of ‘man is white’ is ‘man is not white’, not ‘man is not-white’. For otherwise, since either the positive or the negative proposition is true of any subject, it will turn out true to say that a piece of wood is a man that is not white.

Now if this is the case, in those propositions which do not contain the verb ‘to be’ the verb which takes its place will exercise the same function. Thus the contradictory of ‘man walks’ is ‘man does not walk’, not ‘not-man walks’; for to say ‘man walks’ merely equivalent to saying ‘man is walking’.

If then this rule is universal, the contradictory of ‘it may be’ is may not be’, not ‘it cannot be’.

Now it appears that the same thing both may and may not be; for instance, everything that may be cut or may walk may also escape cutting and refrain from walking; and the reason is that those things that have potentiality in this sense are not always actual. In such cases, both the positive and the negative propositions will be true; for that which is capable of walking or of being seen has also a potentiality in the opposite direction.

But since it is impossible that contradictory propositions should both be true of the same subject, it follows that’ it may not be’ is not the contradictory of ‘it may be’. For it is a logical consequence of what we have said, either that the same predicate can be both applicable and inapplicable to one and the same subject at the same time, or that it is not by the addition of the verbs ‘be’ and ‘not be’, respectively, that positive and negative propositions are formed. If the former of these alternatives must be rejected, we must choose the latter.

The contradictory, then, of ‘it may be’ is ‘it cannot be’. The same rule applies to the proposition ‘it is contingent that it

should be'; the contradictory of this is 'it is not contingent that it should be'. The similar propositions, such as 'it is necessary' and 'it is impossible', may be dealt with in the same manner. For it comes about that just as in the former instances the verbs 'is' and 'is not' were added to the subject-matter of the sentence 'white' and 'man', so here 'that it should be' and 'that it should not be' are the subject-matter and 'is possible', 'is contingent', are added. These indicate that a certain thing is or is not possible, just as in the former instances 'is' and 'is not' indicated that certain things were or were not the case.

The contradictory, then, of 'it may not be' is not 'it cannot be', but 'it cannot not be', and the contradictory of 'it may be' is not 'it may not be', but cannot be'. Thus the propositions 'it may be' and 'it may not be' appear each to imply the other: for, since these two propositions are not contradictory, the same thing both may and may not be. But the propositions 'it may be' and 'it cannot be' can never be true of the same subject at the same time, for they are contradictory. Nor can the propositions 'it may not be' and 'it cannot not be' be at once true of the same subject.

The propositions which have to do with necessity are governed by the same principle. The contradictory of 'it is necessary that it should be', is not 'it is necessary that it should not be,' but 'it is not necessary that it should be', and the contradictory of 'it is necessary that it should not be' is 'it is not necessary that it should not be'.

Again, the contradictory of 'it is impossible that it should be' is not 'it is impossible that it should not be' but 'it is not impossible that it should be', and the contradictory of 'it is impossible that it should not be' is 'it is not impossible that it should not be'.

To generalize, we must, as has been stated, define the clauses 'that it should be' and 'that it should not be' as the subject-matter of the propositions, and in making these terms into affirmations and denials we must combine them with 'that it should be' and 'that it should not be' respectively.

We must consider the following pairs as contradictory propositions:

It may be.It cannot be.

It is contingent.It is not contingent.

It is impossible.It is not impossible.

It is necessary.It is not necessary.

It is true.It is not true.

13

Logical sequences follow in due course when we have arranged the propositions thus. From the proposition 'it may be' it follows that it is contingent, and the relation is reciprocal. It follows also that it is not impossible and not necessary.

From the proposition 'it may not be' or 'it is contingent that it should not be' it follows that it is not necessary that it should not be and that it is not impossible that it should not be. From the proposition 'it cannot be' or 'it is not contingent' it follows that it is necessary that it should not be and that it is impossible that it should be. From the proposition 'it cannot not be' or 'it is not contingent that it should not be' it follows that it

is necessary that it should be and that it is impossible that it should not be.

Let us consider these statements by the help of a table:

A.	B.
It may be.	It cannot be.
It is contingent.	It is not contingent.
It is not impossible that it should be.	It is impossible that it should be.
It is not necessary that it should be.	It is necessary that it should not be.

C.	D.
It may not be.	It cannot not be.
It is contingent that it should not be.	It is not contingent that it should not be.
It is not impossible that it should not be.	It is impossible that it should not be.
It is not necessary that it should not be.	It is necessary that it should be.

Now the propositions 'it is impossible that it should be' and 'it is not impossible that it should be' are consequent upon the propositions 'it may be', 'it is contingent', and 'it cannot be', 'it is not contingent', the contradictories upon the contradictories.

But there is inversion. The negative of the proposition 'it is impossible' is consequent upon the proposition 'it may be' and the corresponding positive in the first case upon the negative in the second. For 'it is impossible' is a positive proposition and 'it is not impossible' is negative.

We must investigate the relation subsisting between these propositions and those which predicate necessity. That there is a distinction is clear. In this case, contrary propositions follow respectively from contradictory propositions, and the contradictory propositions belong to separate sequences. For the proposition 'it is not necessary that it should be' is not the negative of 'it is necessary that it should not be', for both these propositions may be true of the same subject; for when it is necessary that a thing should not be, it is not necessary that it should be. The reason why the propositions predicating necessity do not follow in the same kind of sequence as the rest, lies in the fact that the proposition 'it is impossible' is equivalent, when used with a contrary subject, to the proposition 'it is necessary'. For when it is impossible that a thing should be, it is necessary, not that it should be, but that it should not be, and when it is impossible that a thing should not be, it is necessary that it should be. Thus, if the propositions predicating impossibility or non-impossibility follow without change of subject from those predicating possibility or non-possibility, those predicating necessity must follow with the contrary subject; for the propositions 'it is impossible' and 'it is necessary' are not equivalent, but, as has been said, inversely connected.

Yet perhaps it is impossible that the contradictory propositions predicating necessity should be thus arranged. For when it is necessary that a thing should be, it is possible that it should be. (For if not, the opposite follows, since one or the other must follow; so, if it is not possible, it is impossible, and it is thus

impossible that a thing should be, which must necessarily be; which is absurd.)

Yet from the proposition ‘it may be’ it follows that it is not impossible, and from that it follows that it is not necessary; it comes about therefore that the thing which must necessarily be need not be; which is absurd. But again, the proposition ‘it is necessary that it should be’ does not follow from the proposition ‘it may be’, nor does the proposition ‘it is necessary that it should not be’. For the proposition ‘it may be’ implies a twofold possibility, while, if either of the two former propositions is true, the twofold possibility vanishes. For if a thing may be, it may also not be, but if it is necessary that it should be or that it should not be, one of the two alternatives will be excluded. It remains, therefore, that the proposition ‘it is not necessary that it should not be’ follows from the proposition ‘it may be’. For this is true also of that which must necessarily be.

Moreover the proposition ‘it is not necessary that it should not be’ is the contradictory of that which follows from the proposition ‘it cannot be’; for ‘it cannot be’ is followed by ‘it is impossible that it should be’ and by ‘it is necessary that it should not be’, and the contradictory of this is the proposition ‘it is not necessary that it should not be’. Thus in this case also contradictory propositions follow contradictory in the way indicated, and no logical impossibilities occur when they are thus arranged.

It may be questioned whether the proposition ‘it may be’ follows from the proposition ‘it is necessary that it should be’. If not, the contradictory must follow, namely that it cannot be, or, if a man should maintain that this is not the contradictory, then the proposition ‘it may not be’.

Now both of these are false of that which necessarily is. At the same time, it is thought that if a thing may be cut it may also not be cut, if a thing may be it may also not be, and thus it would follow that a thing which must necessarily be may possibly not be; which is false. It is evident, then, that it is not always the case that that which may be or may walk possesses also a potentiality in the other direction. There are exceptions. In the first place we must except those things which possess a potentiality not in accordance with a rational principle, as fire possesses the potentiality of giving out heat, that is, an irrational capacity. Those potentialities which involve a rational principle are potentialities of more than one result, that is, of contrary results; those that are irrational are not always thus constituted. As I have said, fire cannot both heat and not heat, neither has anything that is always actual any twofold potentiality. Yet some even of those potentialities which are irrational admit of opposite results. However, thus much has been said to emphasize the truth that it is not every potentiality which admits of opposite results, even where the word is used always in the same sense.

But in some cases the word is used equivocally. For the term 'possible' is ambiguous, being used in the one case with reference to facts, to that which is actualized, as when a man is said to find walking possible because he is actually walking, and generally when a capacity is predicated because it is actually realized; in the other case, with reference to a state in which realization is conditionally practicable, as when a man is said to find walking possible because under certain conditions he would walk. This last sort of potentiality belongs only to that which can be in motion, the former can exist also in the case of that which has not this power. Both of that which is walking and is actual, and of that which has the capacity though not necessarily realized, it is true to say that it is not impossible that it should walk (or, in the other case, that it should be), but

while we cannot predicate this latter kind of potentiality of that which is necessary in the unqualified sense of the word, we can predicate the former.

Our conclusion, then, is this: that since the universal is consequent upon the particular, that which is necessary is also possible, though not in every sense in which the word may be used.

We may perhaps state that necessity and its absence are the initial principles of existence and non-existence, and that all else must be regarded as posterior to these.

It is plain from what has been said that that which is of necessity is actual. Thus, if that which is eternal is prior, actuality also is prior to potentiality. Some things are actualities without potentiality, namely, the primary substances; a second class consists of those things which are actual but also potential, whose actuality is in nature prior to their potentiality, though posterior in time; a third class comprises those things which are never actualized, but are pure potentialities.

14

The question arises whether an affirmation finds its contrary in a denial or in another affirmation; whether the proposition ‘every man is just’ finds its contrary in the proposition ‘no man is just’, or in the proposition ‘every man is unjust’. Take the propositions ‘Callias is just’, ‘Callias is not just’, ‘Callias is unjust’; we have to discover which of these form contraries.

Now if the spoken word corresponds with the judgement of the mind, and if, in thought, that judgement is the contrary of

another, which pronounces a contrary fact, in the way, for instance, in which the judgement ‘every man is just’ pronounces a contrary to that pronounced by the judgement ‘every man is unjust’, the same must needs hold good with regard to spoken affirmations.

But if, in thought, it is not the judgement which pronounces a contrary fact that is the contrary of another, then one affirmation will not find its contrary in another, but rather in the corresponding denial. We must therefore consider which true judgement is the contrary of the false, that which forms the denial of the false judgement or that which affirms the contrary fact.

Let me illustrate. There is a true judgement concerning that which is good, that it is good; another, a false judgement, that it is not good; and a third, which is distinct, that it is bad. Which of these two is contrary to the true? And if they are one and the same, which mode of expression forms the contrary?

It is an error to suppose that judgements are to be defined as contrary in virtue of the fact that they have contrary subjects; for the judgement concerning a good thing, that it is good, and that concerning a bad thing, that it is bad, may be one and the same, and whether they are so or not, they both represent the truth. Yet the subjects here are contrary. But judgements are not contrary because they have contrary subjects, but because they are to the contrary effect.

Now if we take the judgement that that which is good is good, and another that it is not good, and if there are at the same time other attributes, which do not and cannot belong to the good, we must nevertheless refuse to treat as the contraries of the true judgement those which opine that some other attribute subsists which does not subsist, as also those that opine that

some other attribute does not subsist which does subsist, for both these classes of judgement are of unlimited content.

Those judgements must rather be termed contrary to the true judgements, in which error is present. Now these judgements are those which are concerned with the starting points of generation, and generation is the passing from one extreme to its opposite; therefore error is a like transition.

Now that which is good is both good and not bad. The first quality is part of its essence, the second accidental; for it is by accident that it is not bad. But if that true judgement is most really true, which concerns the subject's intrinsic nature, then that false judgement likewise is most really false, which concerns its intrinsic nature. Now the judgement that that is good is not good is a false judgement concerning its intrinsic nature, the judgement that it is bad is one concerning that which is accidental. Thus the judgement which denies the true judgement is more really false than that which positively asserts the presence of the contrary quality. But it is the man who forms that judgement which is contrary to the true who is most thoroughly deceived, for contraries are among the things which differ most widely within the same class. If then of the two judgements one is contrary to the true judgement, but that which is contradictory is the more truly contrary, then the latter, it seems, is the real contrary. The judgement that that which is good is bad is composite. For presumably the man who forms that judgement must at the same time understand that that which is good is not good.

Further, the contradictory is either always the contrary or never; therefore, if it must necessarily be so in all other cases, our conclusion in the case just dealt with would seem to be correct. Now where terms have no contrary, that judgement is false, which forms the negative of the true; for instance, he who

thinks a man is not a man forms a false judgement. If then in these cases the negative is the contrary, then the principle is universal in its application.

Again, the judgement that that which is not good is not good is parallel with the judgement that that which is good is good. Besides these there is the judgement that that which is good is not good, parallel with the judgement that that that is not good is good. Let us consider, therefore, what would form the contrary of the true judgement that that which is not good is not good. The judgement that it is bad would, of course, fail to meet the case, since two true judgements are never contrary and this judgement might be true at the same time as that with which it is connected. For since some things which are not good are bad, both judgements may be true. Nor is the judgement that it is not bad the contrary, for this too might be true, since both qualities might be predicated of the same subject. It remains, therefore, that of the judgement concerning that which is not good, that it is not good, the contrary judgement is that it is good; for this is false. In the same way, moreover, the judgement concerning that which is good, that it is not good, is the contrary of the judgement that it is good.

It is evident that it will make no difference if we universalize the positive judgement, for the universal negative judgement will form the contrary. For instance, the contrary of the judgement that everything that is good is good is that nothing that is good is good. For the judgement that that which is good is good, if the subject be understood in a universal sense, is equivalent to the judgement that whatever is good is good, and this is identical with the judgement that everything that is good is good. We may deal similarly with judgements concerning that which is not good.

If therefore this is the rule with judgements, and if spoken affirmations and denials are judgements expressed in words, it is plain that the universal denial is the contrary of the affirmation about the same subject. Thus the propositions 'everything good is good', 'every man is good', have for their contraries the propositions 'nothing good is good', 'no man is good'. The contradictory propositions, on the other hand, are 'not everything good is good', 'not every man is good'.

It is evident, also, that neither true judgements nor true propositions can be contrary the one to the other. For whereas, when two propositions are true, a man may state both at the same time without inconsistency, contrary propositions are those which state contrary conditions, and contrary conditions cannot subsist at one and the same time in the same subject.

Aristotle - Prior Analytics

[Translated by A. J. Jenkinson]

Book I

1

We must first state the subject of our inquiry and the faculty to which it belongs: its subject is demonstration and the faculty that carries it out demonstrative science. We must next define a premiss, a term, and a syllogism, and the nature of a perfect and of an imperfect syllogism; and after that, the inclusion or noninclusion of one term in another as in a whole, and what we mean by predicating one term of all, or none, of another.

A premiss then is a sentence affirming or denying one thing of another. This is either universal or particular or indefinite. By universal I mean the statement that something belongs to all or none of something else; by particular that it belongs to some or not to some or not to all; by indefinite that it does or does not belong, without any mark to show whether it is universal or particular, e.g. 'contraries are subjects of the same science', or 'pleasure is not good'. The demonstrative premiss differs from the dialectical, because the demonstrative premiss is the assertion of one of two contradictory statements (the demonstrator does not ask for his premiss, but lays it down), whereas the dialectical premiss depends on the adversary's choice between two contradictories. But this will make no difference to the production of a syllogism in either case; for both the demonstrator and the dialectician argue syllogistically after stating that something does or does not belong to

something else. Therefore a syllogistic premiss without qualification will be an affirmation or denial of something concerning something else in the way we have described; it will be demonstrative, if it is true and obtained through the first principles of its science; while a dialectical premiss is the giving of a choice between two contradictories, when a man is proceeding by question, but when he is syllogizing it is the assertion of that which is apparent and generally admitted, as has been said in the Topics. The nature then of a premiss and the difference between syllogistic, demonstrative, and dialectical premisses, may be taken as sufficiently defined by us in relation to our present need, but will be stated accurately in the sequel.

I call that a term into which the premiss is resolved, i.e. both the predicate and that of which it is predicated, 'being' being added and 'not being' removed, or vice versa.

A syllogism is discourse in which, certain things being stated, something other than what is stated follows of necessity from their being so. I mean by the last phrase that they produce the consequence, and by this, that no further term is required from without in order to make the consequence necessary.

I call that a perfect syllogism which needs nothing other than what has been stated to make plain what necessarily follows; a syllogism is imperfect, if it needs either one or more propositions, which are indeed the necessary consequences of the terms set down, but have not been expressly stated as premisses.

That one term should be included in another as in a whole is the same as for the other to be predicated of all of the first. And we say that one term is predicated of all of another, whenever no instance of the subject can be found of which the other term

cannot be asserted: ‘to be predicated of none’ must be understood in the same way.

2

Every premiss states that something either is or must be or may be the attribute of something else; of premisses of these three kinds some are affirmative, others negative, in respect of each of the three modes of attribution; again some affirmative and negative premisses are universal, others particular, others indefinite. It is necessary then that in universal attribution the terms of the negative premiss should be convertible, e.g. if no pleasure is good, then no good will be pleasure; the terms of the affirmative must be convertible, not however, universally, but in part, e.g. if every pleasure,is good, some good must be pleasure; the particular affirmative must convert in part (for if some pleasure is good, then some good will be pleasure); but the particular negative need not convert, for if some animal is not man, it does not follow that some man is not animal.

First then take a universal negative with the terms A and B. If no B is A, neither can any A be B. For if some A (say C) were B, it would not be true that no B is A; for C is a B. But if every B is A then some A is B. For if no A were B, then no B could be A. But we assumed that every B is A. Similarly too, if the premiss is particular. For if some B is A, then some of the As must be B. For if none were, then no B would be A. But if some B is not A, there is no necessity that some of the As should not be B; e.g. let B stand for animal and A for man. Not every animal is a man; but every man is an animal.

3

The same manner of conversion will hold good also in respect of necessary premisses. The universal negative converts universally; each of the affirmatives converts into a particular. If it is necessary that no B is A, it is necessary also that no A is B. For if it is possible that some A is B, it would be possible also that some B is A. If all or some B is A of necessity, it is necessary also that some A is B: for if there were no necessity, neither would some of the Bs be A necessarily. But the particular negative does not convert, for the same reason which we have already stated.

In respect of possible premisses, since possibility is used in several senses (for we say that what is necessary and what is not necessary and what is potential is possible), affirmative statements will all convert in a manner similar to those described. For if it is possible that all or some B is A, it will be possible that some A is B. For if that were not possible, then no B could possibly be A. This has been already proved. But in negative statements the case is different. Whatever is said to be possible, either because B necessarily is A, or because B is not necessarily A, admits of conversion like other negative statements, e.g. if one should say, it is possible that man is not horse, or that no garment is white. For in the former case the one term necessarily does not belong to the other; in the latter there is no necessity that it should: and the premiss converts like other negative statements. For if it is possible for no man to be a horse, it is also admissible for no horse to be a man; and if it is admissible for no garment to be white, it is also admissible for nothing white to be a garment. For if any white thing must be a garment, then some garment will necessarily be white. This has been already proved. The particular negative also must be

treated like those dealt with above. But if anything is said to be possible because it is the general rule and natural (and it is in this way we define the possible), the negative premisses can no longer be converted like the simple negatives; the universal negative premiss does not convert, and the particular does. This will be plain when we speak about the possible. At present we may take this much as clear in addition to what has been said: the statement that it is possible that no B is A or some B is not A is affirmative in form: for the expression 'is possible' ranks along with 'is', and 'is' makes an affirmation always and in every case, whatever the terms to which it is added, in predication, e.g. 'it is not-good' or 'it is not-white' or in a word 'it is not-this'. But this also will be proved in the sequel. In conversion these premisses will behave like the other affirmative propositions.

4

After these distinctions we now state by what means, when, and how every syllogism is produced; subsequently we must speak of demonstration. Syllogism should be discussed before demonstration because syllogism is the general: the demonstration is a sort of syllogism, but not every syllogism is a demonstration.

Whenever three terms are so related to one another that the last is contained in the middle as in a whole, and the middle is either contained in, or excluded from, the first as in or from a whole, the extremes must be related by a perfect syllogism. I call that term middle which is itself contained in another and contains another in itself: in position also this comes in the middle. By extremes I mean both that term which is itself

contained in another and that in which another is contained. If A is predicated of all B, and B of all C, A must be predicated of all C: we have already explained what we mean by 'predicated of all'. Similarly also, if A is predicated of no B, and B of all C, it is necessary that no C will be A.

But if the first term belongs to all the middle, but the middle to none of the last term, there will be no syllogism in respect of the extremes; for nothing necessary follows from the terms being so related; for it is possible that the first should belong either to all or to none of the last, so that neither a particular nor a universal conclusion is necessary. But if there is no necessary consequence, there cannot be a syllogism by means of these premisses. As an example of a universal affirmative relation between the extremes we may take the terms animal, man, horse; of a universal negative relation, the terms animal, man, stone. Nor again can syllogism be formed when neither the first term belongs to any of the middle, nor the middle to any of the last. As an example of a positive relation between the extremes take the terms science, line, medicine: of a negative relation science, line, unit.

If then the terms are universally related, it is clear in this figure when a syllogism will be possible and when not, and that if a syllogism is possible the terms must be related as described, and if they are so related there will be a syllogism.

But if one term is related universally, the other in part only, to its subject, there must be a perfect syllogism whenever universality is posited with reference to the major term either affirmatively or negatively, and particularity with reference to the minor term affirmatively: but whenever the universality is posited in relation to the minor term, or the terms are related in any other way, a syllogism is impossible. I call that term the major in which the middle is contained and that term the

minor which comes under the middle. Let all B be A and some C be B. Then if 'predicated of all' means what was said above, it is necessary that some C is A. And if no B is A but some C is B, it is necessary that some C is not A. The meaning of 'predicated of none' has also been defined. So there will be a perfect syllogism. This holds good also if the premiss BC should be indefinite, provided that it is affirmative: for we shall have the same syllogism whether the premiss is indefinite or particular.

But if the universality is posited with respect to the minor term either affirmatively or negatively, a syllogism will not be possible, whether the major premiss is positive or negative, indefinite or particular: e.g. if some B is or is not A, and all C is B. As an example of a positive relation between the extremes take the terms good, state, wisdom: of a negative relation, good, state, ignorance. Again if no C is B, but some B is or is not A or not every B is A, there cannot be a syllogism. Take the terms white, horse, swan: white, horse, raven. The same terms may be taken also if the premiss BA is indefinite.

Nor when the major premiss is universal, whether affirmative or negative, and the minor premiss is negative and particular, can there be a syllogism, whether the minor premiss be indefinite or particular: e.g. if all B is A and some C is not B, or if not all C is B. For the major term may be predicable both of all and of none of the minor, to some of which the middle term cannot be attributed. Suppose the terms are animal, man, white: next take some of the white things of which man is not predicated – swan and snow: animal is predicated of all of the one, but of none of the other. Consequently there cannot be a syllogism. Again let no B be A, but let some C not be B. Take the terms inanimate, man, white: then take some white things of which man is not predicated – swan and snow: the term inanimate is predicated of all of the one, of none of the other.

Further since it is indefinite to say some C is not B, and it is true that some C is not B, whether no C is B, or not all C is B, and since if terms are assumed such that no C is B, no syllogism follows (this has already been stated) it is clear that this arrangement of terms will not afford a syllogism: otherwise one would have been possible with a universal negative minor premiss. A similar proof may also be given if the universal premiss is negative.

Nor can there in any way be a syllogism if both the relations of subject and predicate are particular, either positively or negatively, or the one negative and the other affirmative, or one indefinite and the other definite, or both indefinite. Terms common to all the above are animal, white, horse: animal, white, stone.

It is clear then from what has been said that if there is a syllogism in this figure with a particular conclusion, the terms must be related as we have stated: if they are related otherwise, no syllogism is possible anyhow. It is evident also that all the syllogisms in this figure are perfect (for they are all completed by means of the premisses originally taken) and that all conclusions are proved by this figure, viz. universal and particular, affirmative and negative. Such a figure I call the first.

5

Whenever the same thing belongs to all of one subject, and to none of another, or to all of each subject or to none of either, I call such a figure the second; by middle term in it I mean that which is predicated of both subjects, by extremes the terms of which this is said, by major extreme that which lies near the middle, by minor that which is further away from the middle.

The middle term stands outside the extremes, and is first in position. A syllogism cannot be perfect anyhow in this figure, but it may be valid whether the terms are related universally or not.

If then the terms are related universally a syllogism will be possible, whenever the middle belongs to all of one subject and to none of another (it does not matter which has the negative relation), but in no other way. Let M be predicated of no N, but of all O. Since, then, the negative relation is convertible, N will belong to no M: but M was assumed to belong to all O: consequently N will belong to no O. This has already been proved. Again if M belongs to all N, but to no O, then N will belong to no O. For if M belongs to no O, O belongs to no M: but M (as was said) belongs to all N: O then will belong to no N: for the first figure has again been formed. But since the negative relation is convertible, N will belong to no O. Thus it will be the same syllogism that proves both conclusions.

It is possible to prove these results also by reductio ad impossibile.

It is clear then that a syllogism is formed when the terms are so related, but not a perfect syllogism; for necessity is not perfectly established merely from the original premisses; others also are needed.

But if M is predicated of every N and O, there cannot be a syllogism. Terms to illustrate a positive relation between the extremes are substance, animal, man; a negative relation, substance, animal, number – substance being the middle term.

Nor is a syllogism possible when M is predicated neither of any N nor of any O. Terms to illustrate a positive relation are line, animal, man: a negative relation, line, animal, stone.

It is clear then that if a syllogism is formed when the terms are universally related, the terms must be related as we stated at the outset: for if they are otherwise related no necessary consequence follows.

If the middle term is related universally to one of the extremes, a particular negative syllogism must result whenever the middle term is related universally to the major whether positively or negatively, and particularly to the minor and in a manner opposite to that of the universal statement: by 'an opposite manner' I mean, if the universal statement is negative, the particular is affirmative: if the universal is affirmative, the particular is negative. For if M belongs to no N, but to some O, it is necessary that N does not belong to some O. For since the negative statement is convertible, N will belong to no M: but M was admitted to belong to some O: therefore N will not belong to some O: for the result is reached by means of the first figure. Again if M belongs to all N, but not to some O, it is necessary that N does not belong to some O: for if N belongs to all O, and M is predicated also of all N, M must belong to all O: but we assumed that M does not belong to some O. And if M belongs to all N but not to all O, we shall conclude that N does not belong to all O: the proof is the same as the above. But if M is predicated of all O, but not of all N, there will be no syllogism. Take the terms animal, substance, raven; animal, white, raven. Nor will there be a conclusion when M is predicated of no O, but of some N. Terms to illustrate a positive relation between the extremes are animal, substance, unit: a negative relation, animal, substance, science.

If then the universal statement is opposed to the particular, we have stated when a syllogism will be possible and when not: but if the premisses are similar in form, I mean both negative or both affirmative, a syllogism will not be possible anyhow. First let them be negative, and let the major premiss be universal, e.g.

let M belong to no N, and not to some O. It is possible then for N to belong either to all O or to no O. Terms to illustrate the negative relation are black, snow, animal. But it is not possible to find terms of which the extremes are related positively and universally, if M belongs to some O, and does not belong to some O. For if N belonged to all O, but M to no N, then M would belong to no O: but we assumed that it belongs to some O. In this way then it is not admissible to take terms: our point must be proved from the indefinite nature of the particular statement. For since it is true that M does not belong to some O, even if it belongs to no O, and since if it belongs to no O a syllogism is (as we have seen) not possible, clearly it will not be possible now either.

Again let the premisses be affirmative, and let the major premiss as before be universal, e.g. let M belong to all N and to some O. It is possible then for N to belong to all O or to no O. Terms to illustrate the negative relation are white, swan, stone. But it is not possible to take terms to illustrate the universal affirmative relation, for the reason already stated: the point must be proved from the indefinite nature of the particular statement. But if the minor premiss is universal, and M belongs to no O, and not to some N, it is possible for N to belong either to all O or to no O. Terms for the positive relation are white, animal, raven: for the negative relation, white, stone, raven. If the premisses are affirmative, terms for the negative relation are white, animal, snow; for the positive relation, white, animal, swan. Evidently then, whenever the premisses are similar in form, and one is universal, the other particular, a syllogism can, not be formed anyhow. Nor is one possible if the middle term belongs to some of each of the extremes, or does not belong to some of either, or belongs to some of the one, not to some of the other, or belongs to neither universally, or is related to them indefinitely. Common terms for all the above are white, animal, man: white, animal, inanimate. It is clear then from what has

been said that if the terms are related to one another in the way stated, a syllogism results of necessity; and if there is a syllogism, the terms must be so related. But it is evident also that all the syllogisms in this figure are imperfect: for all are made perfect by certain supplementary statements, which either are contained in the terms of necessity or are assumed as hypotheses, i.e. when we prove per impossibile. And it is evident that an affirmative conclusion is not attained by means of this figure, but all are negative, whether universal or particular.

6

But if one term belongs to all, and another to none, of a third, or if both belong to all, or to none, of it, I call such a figure the third; by middle term in it I mean that of which both the predicates are predicated, by extremes I mean the predicates, by the major extreme that which is further from the middle, by the minor that which is nearer to it. The middle term stands outside the extremes, and is last in position. A syllogism cannot be perfect in this figure either, but it may be valid whether the terms are related universally or not to the middle term.

If they are universal, whenever both P and R belong to S, it follows that P will necessarily belong to some R. For, since the affirmative statement is convertible, S will belong to some R: consequently since P belongs to all S, and S to some R, P must belong to some R: for a syllogism in the first figure is produced. It is possible to demonstrate this also per impossibile and by exposition. For if both P and R belong to all S, should one of the Ss, e.g. N, be taken, both P and R will belong to this, and thus P will belong to some R.

If R belongs to all S, and P to no S, there will be a syllogism to prove that P will necessarily not belong to some R. This may be demonstrated in the same way as before by converting the premiss RS. It might be proved also per impossibile, as in the former cases. But if R belongs to no S, P to all S, there will be no syllogism. Terms for the positive relation are animal, horse, man: for the negative relation animal, inanimate, man.

Nor can there be a syllogism when both terms are asserted of no S. Terms for the positive relation are animal, horse, inanimate; for the negative relation man, horse, inanimate – inanimate being the middle term.

It is clear then in this figure also when a syllogism will be possible and when not, if the terms are related universally. For whenever both the terms are affirmative, there will be a syllogism to prove that one extreme belongs to some of the other; but when they are negative, no syllogism will be possible. But when one is negative, the other affirmative, if the major is negative, the minor affirmative, there will be a syllogism to prove that the one extreme does not belong to some of the other: but if the relation is reversed, no syllogism will be possible. If one term is related universally to the middle, the other in part only, when both are affirmative there must be a syllogism, no matter which of the premisses is universal. For if R belongs to all S, P to some S, P must belong to some R. For since the affirmative statement is convertible S will belong to some P: consequently since R belongs to all S, and S to some P, R must also belong to some P: therefore P must belong to some R.

Again if R belongs to some S, and P to all S, P must belong to some R. This may be demonstrated in the same way as the preceding. And it is possible to demonstrate it also per impossibile and by exposition, as in the former cases. But if one term is affirmative, the other negative, and if the affirmative is

universal, a syllogism will be possible whenever the minor term is affirmative. For if R belongs to all S, but P does not belong to some S, it is necessary that P does not belong to some R. For if P belongs to all R, and R belongs to all S, then P will belong to all S: but we assumed that it did not. Proof is possible also without reduction ad impossibile, if one of the Ss be taken to which P does not belong.

But whenever the major is affirmative, no syllogism will be possible, e.g. if P belongs to all S and R does not belong to some S. Terms for the universal affirmative relation are animate, man, animal. For the universal negative relation it is not possible to get terms, if R belongs to some S, and does not belong to some S. For if P belongs to all S, and R to some S, then P will belong to some R: but we assumed that it belongs to no R. We must put the matter as before.' Since the expression 'it does not belong to some' is indefinite, it may be used truly of that also which belongs to none. But if R belongs to no S, no syllogism is possible, as has been shown. Clearly then no syllogism will be possible here.

But if the negative term is universal, whenever the major is negative and the minor affirmative there will be a syllogism. For if P belongs to no S, and R belongs to some S, P will not belong to some R: for we shall have the first figure again, if the premiss RS is converted.

But when the minor is negative, there will be no syllogism. Terms for the positive relation are animal, man, wild: for the negative relation, animal, science, wild – the middle in both being the term wild.

Nor is a syllogism possible when both are stated in the negative, but one is universal, the other particular. When the minor is related universally to the middle, take the terms animal, science, wild; animal, man, wild. When the major is related

universally to the middle, take as terms for a negative relation raven, snow, white. For a positive relation terms cannot be found, if R belongs to some S, and does not belong to some S. For if P belongs to all R, and R to some S, then P belongs to some S: but we assumed that it belongs to no S. Our point, then, must be proved from the indefinite nature of the particular statement.

Nor is a syllogism possible anyhow, if each of the extremes belongs to some of the middle or does not belong, or one belongs and the other does not to some of the middle, or one belongs to some of the middle, the other not to all, or if the premisses are indefinite. Common terms for all are animal, man, white: animal, inanimate, white.

It is clear then in this figure also when a syllogism will be possible, and when not; and that if the terms are as stated, a syllogism results of necessity, and if there is a syllogism, the terms must be so related. It is clear also that all the syllogisms in this figure are imperfect (for all are made perfect by certain supplementary assumptions), and that it will not be possible to reach a universal conclusion by means of this figure, whether negative or affirmative.

7

It is evident also that in all the figures, whenever a proper syllogism does not result, if both the terms are affirmative or negative nothing necessary follows at all, but if one is affirmative, the other negative, and if the negative is stated universally, a syllogism always results relating the minor to the major term, e.g. if A belongs to all or some B, and B belongs to no C: for if the premisses are converted it is necessary that C

does not belong to some A. Similarly also in the other figures: a syllogism always results by means of conversion. It is evident also that the substitution of an indefinite for a particular affirmative will effect the same syllogism in all the figures.

It is clear too that all the imperfect syllogisms are made perfect by means of the first figure. For all are brought to a conclusion either ostensively or per impossibile. In both ways the first figure is formed: if they are made perfect ostensively, because (as we saw) all are brought to a conclusion by means of conversion, and conversion produces the first figure: if they are proved per impossibile, because on the assumption of the false statement the syllogism comes about by means of the first figure, e.g. in the last figure, if A and B belong to all C, it follows that A belongs to some B: for if A belonged to no B, and B belongs to all C, A would belong to no C: but (as we stated) it belongs to all C. Similarly also with the rest.

It is possible also to reduce all syllogisms to the universal syllogisms in the first figure. Those in the second figure are clearly made perfect by these, though not all in the same way; the universal syllogisms are made perfect by converting the negative premiss, each of the particular syllogisms by reductio ad impossibile. In the first figure particular syllogisms are indeed made perfect by themselves, but it is possible also to prove them by means of the second figure, reducing them ad impossibile, e.g. if A belongs to all B, and B to some C, it follows that A belongs to some C. For if it belonged to no C, and belongs to all B, then B will belong to no C: this we know by means of the second figure. Similarly also demonstration will be possible in the case of the negative. For if A belongs to no B, and B belongs to some C, A will not belong to some C: for if it belonged to all C, and belongs to no B, then B will belong to no C: and this (as we saw) is the middle figure. Consequently, since all syllogisms in the middle figure can be reduced to universal

syllogisms in the first figure, and since particular syllogisms in the first figure can be reduced to syllogisms in the middle figure, it is clear that particular syllogisms can be reduced to universal syllogisms in the first figure. Syllogisms in the third figure, if the terms are universal, are directly made perfect by means of those syllogisms; but, when one of the premisses is particular, by means of the particular syllogisms in the first figure: and these (we have seen) may be reduced to the universal syllogisms in the first figure: consequently also the particular syllogisms in the third figure may be so reduced. It is clear then that all syllogisms may be reduced to the universal syllogisms in the first figure.

We have stated then how syllogisms which prove that something belongs or does not belong to something else are constituted, both how syllogisms of the same figure are constituted in themselves, and how syllogisms of different figures are related to one another.

8

Since there is a difference according as something belongs, necessarily belongs, or may belong to something else (for many things belong indeed, but not necessarily, others neither necessarily nor indeed at all, but it is possible for them to belong), it is clear that there will be different syllogisms to prove each of these relations, and syllogisms with differently related terms, one syllogism concluding from what is necessary, another from what is, a third from what is possible.

There is hardly any difference between syllogisms from necessary premisses and syllogisms from premisses which merely assert. When the terms are put in the same way, then,

whether something belongs or necessarily belongs (or does not belong) to something else, a syllogism will or will not result alike in both cases, the only difference being the addition of the expression 'necessarily' to the terms. For the negative statement is convertible alike in both cases, and we should give the same account of the expressions 'to be contained in something as in a whole' and 'to be predicated of all of something'. With the exceptions to be made below, the conclusion will be proved to be necessary by means of conversion, in the same manner as in the case of simple predication. But in the middle figure when the universal statement is affirmative, and the particular negative, and again in the third figure when the universal is affirmative and the particular negative, the demonstration will not take the same form, but it is necessary by the 'exposition' of a part of the subject of the particular negative proposition, to which the predicate does not belong, to make the syllogism in reference to this: with terms so chosen the conclusion will necessarily follow. But if the relation is necessary in respect of the part taken, it must hold of some of that term in which this part is included: for the part taken is just some of that. And each of the resulting syllogisms is in the appropriate figure.

9

It happens sometimes also that when one premiss is necessary the conclusion is necessary, not however when either premiss is necessary, but only when the major is, e.g. if A is taken as necessarily belonging or not belonging to B, but B is taken as simply belonging to C: for if the premisses are taken in this way, A will necessarily belong or not belong to C. For since necessarily belongs, or does not belong, to every B, and since C is one of the Bs, it is clear that for C also the positive or the

negative relation to A will hold necessarily. But if the major premiss is not necessary, but the minor is necessary, the conclusion will not be necessary. For if it were, it would result both through the first figure and through the third that A belongs necessarily to some B. But this is false; for B may be such that it is possible that A should belong to none of it. Further, an example also makes it clear that the conclusion not be necessary, e.g. if A were movement, B animal, C man: man is an animal necessarily, but an animal does not move necessarily, nor does man. Similarly also if the major premiss is negative; for the proof is the same.

In particular syllogisms, if the universal premiss is necessary, then the conclusion will be necessary; but if the particular, the conclusion will not be necessary, whether the universal premiss is negative or affirmative. First let the universal be necessary, and let A belong to all B necessarily, but let B simply belong to some C: it is necessary then that A belongs to some C necessarily: for C falls under B, and A was assumed to belong necessarily to all B. Similarly also if the syllogism should be negative: for the proof will be the same. But if the particular premiss is necessary, the conclusion will not be necessary: for from the denial of such a conclusion nothing impossible results, just as it does not in the universal syllogisms. The same is true of negative syllogisms. Try the terms movement, animal, white.

10

In the second figure, if the negative premiss is necessary, then the conclusion will be necessary, but if the affirmative, not necessary. First let the negative be necessary; let A be possible of no B, and simply belong to C. Since then the negative

statement is convertible, B is possible of no A. But A belongs to all C; consequently B is possible of no C. For C falls under A. The same result would be obtained if the minor premiss were negative: for if A is possible be of no C, C is possible of no A: but A belongs to all B, consequently C is possible of none of the Bs: for again we have obtained the first figure. Neither then is B possible of C: for conversion is possible without modifying the relation.

But if the affirmative premiss is necessary, the conclusion will not be necessary. Let A belong to all B necessarily, but to no C simply. If then the negative premiss is converted, the first figure results. But it has been proved in the case of the first figure that if the negative major premiss is not necessary the conclusion will not be necessary either. Therefore the same result will obtain here. Further, if the conclusion is necessary, it follows that C necessarily does not belong to some A. For if B necessarily belongs to no C, C will necessarily belong to no B. But B at any rate must belong to some A, if it is true (as was assumed) that A necessarily belongs to all B. Consequently it is necessary that C does not belong to some A. But nothing prevents such an A being taken that it is possible for C to belong to all of it. Further one might show by an exposition of terms that the conclusion is not necessary without qualification, though it is a necessary conclusion from the premisses. For example let A be animal, B man, C white, and let the premisses be assumed to correspond to what we had before: it is possible that animal should belong to nothing white. Man then will not belong to anything white, but not necessarily: for it is possible for man to be born white, not however so long as animal belongs to nothing white. Consequently under these conditions the conclusion will be necessary, but it is not necessary without qualification.

Similar results will obtain also in particular syllogisms. For whenever the negative premiss is both universal and necessary, then the conclusion will be necessary: but whenever the affirmative premiss is universal, the negative particular, the conclusion will not be necessary. First then let the negative premiss be both universal and necessary: let it be possible for no B that A should belong to it, and let A simply belong to some C. Since the negative statement is convertible, it will be possible for no A that B should belong to it: but A belongs to some C; consequently B necessarily does not belong to some of the Cs. Again let the affirmative premiss be both universal and necessary, and let the major premiss be affirmative. If then A necessarily belongs to all B, but does not belong to some C, it is clear that B will not belong to some C, but not necessarily. For the same terms can be used to demonstrate the point, which were used in the universal syllogisms. Nor again, if the negative statement is necessary but particular, will the conclusion be necessary. The point can be demonstrated by means of the same terms.

11

In the last figure when the terms are related universally to the middle, and both premisses are affirmative, if one of the two is necessary, then the conclusion will be necessary. But if one is negative, the other affirmative, whenever the negative is necessary the conclusion also will be necessary, but whenever the affirmative is necessary the conclusion will not be necessary. First let both the premisses be affirmative, and let A and B belong to all C, and let AC be necessary. Since then B belongs to all C, C also will belong to some B, because the universal is convertible into the particular: consequently if A

belongs necessarily to all C, and C belongs to some B, it is necessary that A should belong to some B also. For B is under C. The first figure then is formed. A similar proof will be given also if BC is necessary. For C is convertible with some A: consequently if B belongs necessarily to all C, it will belong necessarily also to some A.

Again let AC be negative, BC affirmative, and let the negative premiss be necessary. Since then C is convertible with some B, but A necessarily belongs to no C, A will necessarily not belong to some B either: for B is under C. But if the affirmative is necessary, the conclusion will not be necessary. For suppose BC is affirmative and necessary, while AC is negative and not necessary. Since then the affirmative is convertible, C also will belong to some B necessarily: consequently if A belongs to none of the Cs, while C belongs to some of the Bs, A will not belong to some of the Bs – but not of necessity; for it has been proved, in the case of the first figure, that if the negative premiss is not necessary, neither will the conclusion be necessary. Further, the point may be made clear by considering the terms. Let the term A be ‘good’, let that which B signifies be ‘animal’, let the term C be ‘horse’. It is possible then that the term good should belong to no horse, and it is necessary that the term animal should belong to every horse: but it is not necessary that some animal should not be good, since it is possible for every animal to be good. Or if that is not possible, take as the term ‘awake’ or ‘asleep’: for every animal can accept these.

If, then, the premisses are universal, we have stated when the conclusion will be necessary. But if one premiss is universal, the other particular, and if both are affirmative, whenever the universal is necessary the conclusion also must be necessary. The demonstration is the same as before; for the particular affirmative also is convertible. If then it is necessary that B should belong to all C, and A falls under C, it is necessary that B

should belong to some A. But if B must belong to some A, then A must belong to some B: for conversion is possible. Similarly also if AC should be necessary and universal: for B falls under C. But if the particular premiss is necessary, the conclusion will not be necessary. Let the premiss BC be both particular and necessary, and let A belong to all C, not however necessarily. If the proposition BC is converted the first figure is formed, and the universal premiss is not necessary, but the particular is necessary. But when the premisses were thus, the conclusion (as we proved was not necessary: consequently it is not here either. Further, the point is clear if we look at the terms. Let A be waking, B biped, and C animal. It is necessary that B should belong to some C, but it is possible for A to belong to C, and that A should belong to B is not necessary. For there is no necessity that some biped should be asleep or awake. Similarly and by means of the same terms proof can be made, should the proposition AC be both particular and necessary.

But if one premiss is affirmative, the other negative, whenever the universal is both negative and necessary the conclusion also will be necessary. For if it is not possible that A should belong to any C, but B belongs to some C, it is necessary that A should not belong to some B. But whenever the affirmative proposition is necessary, whether universal or particular, or the negative is particular, the conclusion will not be necessary. The proof of this by reduction will be the same as before; but if terms are wanted, when the universal affirmative is necessary, take the terms 'waking' – 'animal' – 'man', 'man' being middle, and when the affirmative is particular and necessary, take the terms 'waking' – 'animal' – 'white': for it is necessary that animal should belong to some white thing, but it is possible that waking should belong to none, and it is not necessary that waking should not belong to some animal. But when the negative proposition being particular is necessary, take the terms 'biped', 'moving', 'animal', 'animal' being middle.

12

It is clear then that a simple conclusion is not reached unless both premisses are simple assertions, but a necessary conclusion is possible although one only of the premisses is necessary. But in both cases, whether the syllogisms are affirmative or negative, it is necessary that one premiss should be similar to the conclusion. I mean by 'similar', if the conclusion is a simple assertion, the premiss must be simple; if the conclusion is necessary, the premiss must be necessary. Consequently this also is clear, that the conclusion will be neither necessary nor simple unless a necessary or simple premiss is assumed.

13

Perhaps enough has been said about the proof of necessity, how it comes about and how it differs from the proof of a simple statement. We proceed to discuss that which is possible, when and how and by what means it can be proved. I use the terms 'to be possible' and 'the possible' of that which is not necessary but, being assumed, results in nothing impossible. We say indeed ambiguously of the necessary that it is possible. But that my definition of the possible is correct is clear from the phrases by which we deny or on the contrary affirm possibility. For the expressions 'it is not possible to belong', 'it is impossible to belong', and 'it is necessary not to belong' are either identical or follow from one another; consequently their opposites also, 'it is possible to belong', 'it is not impossible to belong', and 'it is not

necessary not to belong', will either be identical or follow from one another. For of everything the affirmation or the denial holds good. That which is possible then will be not necessary and that which is not necessary will be possible. It results that all premisses in the mode of possibility are convertible into one another. I mean not that the affirmative are convertible into the negative, but that those which are affirmative in form admit of conversion by opposition, e.g. 'it is possible to belong' may be converted into 'it is possible not to belong', and 'it is possible for A to belong to all B' into 'it is possible for A to belong to no B' or 'not to all B', and 'it is possible for A to belong to some B' into 'it is possible for A not to belong to some B'. And similarly the other propositions in this mode can be converted. For since that which is possible is not necessary, and that which is not necessary may possibly not belong, it is clear that if it is possible that A should belong to B, it is possible also that it should not belong to B: and if it is possible that it should belong to all, it is also possible that it should not belong to all. The same holds good in the case of particular affirmations: for the proof is identical. And such premisses are affirmative and not negative; for 'to be possible' is in the same rank as 'to be', as was said above.

Having made these distinctions we next point out that the expression 'to be possible' is used in two ways. In one it means to happen generally and fall short of necessity, e.g. man's turning grey or growing or decaying, or generally what naturally belongs to a thing (for this has not its necessity unbroken, since man's existence is not continuous for ever, although if a man does exist, it comes about either necessarily or generally). In another sense the expression means the indefinite, which can be both thus and not thus, e.g. an animal's walking or an earthquake's taking place while it is walking, or generally what happens by chance: for none of these inclines by nature in the one way more than in the opposite.

That which is possible in each of its two senses is convertible into its opposite, not however in the same way: but what is natural is convertible because it does not necessarily belong (for in this sense it is possible that a man should not grow grey) and what is indefinite is convertible because it inclines this way no more than that. Science and demonstrative syllogism are not concerned with things which are indefinite, because the middle term is uncertain; but they are concerned with things that are natural, and as a rule arguments and inquiries are made about things which are possible in this sense. Syllogisms indeed can be made about the former, but it is unusual at any rate to inquire about them.

These matters will be treated more definitely in the sequel; our business at present is to state the moods and nature of the syllogism made from possible premisses. The expression 'it is possible for this to belong to that' may be understood in two senses: 'that' may mean either that to which 'that' belongs or that to which it may belong; for the expression 'A is possible of the subject of B' means that it is possible either of that of which B is stated or of that of which B may possibly be stated. It makes no difference whether we say, A is possible of the subject of B, or all B admits of A. It is clear then that the expression 'A may possibly belong to all B' might be used in two senses. First then we must state the nature and characteristics of the syllogism which arises if B is possible of the subject of C, and A is possible of the subject of B. For thus both premisses are assumed in the mode of possibility; but whenever A is possible of that of which B is true, one premiss is a simple assertion, the other a problematic. Consequently we must start from premisses which are similar in form, as in the other cases.

14

Whenever A may possibly belong to all B, and B to all C, there will be a perfect syllogism to prove that A may possibly belong to all C. This is clear from the definition: for it was in this way that we explained 'to be possible for one term to belong to all of another'. Similarly if it is possible for A to belong no B, and for B to belong to all C, then it is possible for A to belong to no C. For the statement that it is possible for A not to belong to that of which B may be true means (as we saw) that none of those things which can possibly fall under the term B is left out of account. But whenever A may belong to all B, and B may belong to no C, then indeed no syllogism results from the premisses assumed, but if the premiss BC is converted after the manner of problematic propositions, the same syllogism results as before. For since it is possible that B should belong to no C, it is possible also that it should belong to all C. This has been stated above. Consequently if B is possible for all C, and A is possible for all B, the same syllogism again results. Similarly if in both the premisses the negative is joined with 'it is possible': e.g. if A may belong to none of the Bs, and B to none of the Cs. No syllogism results from the assumed premisses, but if they are converted we shall have the same syllogism as before. It is clear then that if the minor premiss is negative, or if both premisses are negative, either no syllogism results, or if one it is not perfect. For the necessity results from the conversion.

But if one of the premisses is universal, the other particular, when the major premiss is universal there will be a perfect syllogism. For if A is possible for all B, and B for some C, then A is possible for some C. This is clear from the definition of being possible. Again if A may belong to no B, and B may belong to some of the Cs, it is necessary that A may possibly not belong to some of the Cs. The proof is the same as above. But if the particular premiss is negative, and the universal is affirmative,

the major still being universal and the minor particular, e.g. A is possible for all B, B may possibly not belong to some C, then a clear syllogism does not result from the assumed premisses, but if the particular premiss is converted and it is laid down that B possibly may belong to some C, we shall have the same conclusion as before, as in the cases given at the beginning.

But if the major premiss is the minor universal, whether both are affirmative, or negative, or different in quality, or if both are indefinite or particular, in no way will a syllogism be possible. For nothing prevents B from reaching beyond A, so that as predicates cover unequal areas. Let C be that by which B extends beyond A. To C it is not possible that A should belong – either to all or to none or to some or not to some, since premisses in the mode of possibility are convertible and it is possible for B to belong to more things than A can. Further, this is obvious if we take terms; for if the premisses are as assumed, the major term is both possible for none of the minor and must belong to all of it. Take as terms common to all the cases under consideration 'animal' – 'white' – 'man', where the major belongs necessarily to the minor; 'animal' – 'white' – 'garment', where it is not possible that the major should belong to the minor. It is clear then that if the terms are related in this manner, no syllogism results. For every syllogism proves that something belongs either simply or necessarily or possibly. It is clear that there is no proof of the first or of the second. For the affirmative is destroyed by the negative, and the negative by the affirmative. There remains the proof of possibility. But this is impossible. For it has been proved that if the terms are related in this manner it is both necessary that the major should belong to all the minor and not possible that it should belong to any. Consequently there cannot be a syllogism to prove the possibility; for the necessary (as we stated) is not possible.

It is clear that if the terms are universal in possible premisses a syllogism always results in the first figure, whether they are affirmative or negative, only a perfect syllogism results in the first case, an imperfect in the second. But possibility must be understood according to the definition laid down, not as covering necessity. This is sometimes forgotten.

15

If one premiss is a simple proposition, the other a problematic, whenever the major premiss indicates possibility all the syllogisms will be perfect and establish possibility in the sense defined; but whenever the minor premiss indicates possibility all the syllogisms will be imperfect, and those which are negative will establish not possibility according to the definition, but that the major does not necessarily belong to any, or to all, of the minor. For if this is so, we say it is possible that it should belong to none or not to all. Let A be possible for all B, and let B belong to all C. Since C falls under B, and A is possible for all B, clearly it is possible for all C also. So a perfect syllogism results. Likewise if the premiss AB is negative, and the premiss BC is affirmative, the former stating possible, the latter simple attribution, a perfect syllogism results proving that A possibly belongs to no C.

It is clear that perfect syllogisms result if the minor premiss states simple belonging: but that syllogisms will result if the modality of the premisses is reversed, must be proved per impossibile. At the same time it will be evident that they are imperfect: for the proof proceeds not from the premisses assumed. First we must state that if B's being follows necessarily from A's being, B's possibility will follow necessarily

from A's possibility. Suppose, the terms being so related, that A is possible, and B is impossible. If then that which is possible, when it is possible for it to be, might happen, and if that which is impossible, when it is impossible, could not happen, and if at the same time A is possible and B impossible, it would be possible for A to happen without B, and if to happen, then to be. For that which has happened, when it has happened, is. But we must take the impossible and the possible not only in the sphere of becoming, but also in the spheres of truth and predicability, and the various other spheres in which we speak of the possible: for it will be alike in all. Further we must understand the statement that B's being depends on A's being, not as meaning that if some single thing A is, B will be: for nothing follows of necessity from the being of some one thing, but from two at least, i.e. when the premisses are related in the manner stated to be that of the syllogism. For if C is predicated of D, and D of F, then C is necessarily predicated of F. And if each is possible, the conclusion also is possible. If then, for example, one should indicate the premisses by A, and the conclusion by B, it would not only result that if A is necessary B is necessary, but also that if A is possible, B is possible.

Since this is proved it is evident that if a false and not impossible assumption is made, the consequence of the assumption will also be false and not impossible: e.g. if A is false, but not impossible, and if B is the consequence of A, B also will be false but not impossible. For since it has been proved that if B's being is the consequence of A's being, then B's possibility will follow from A's possibility (and A is assumed to be possible), consequently B will be possible: for if it were impossible, the same thing would at the same time be possible and impossible.

Since we have defined these points, let A belong to all B, and B be possible for all C: it is necessary then that should be a

possible attribute for all C. Suppose that it is not possible, but assume that B belongs to all C: this is false but not impossible. If then A is not possible for C but B belongs to all C, then A is not possible for all B: for a syllogism is formed in the third degree. But it was assumed that A is a possible attribute for all B. It is necessary then that A is possible for all C. For though the assumption we made is false and not impossible, the conclusion is impossible. It is possible also in the first figure to bring about the impossibility, by assuming that B belongs to C. For if B belongs to all C, and A is possible for all B, then A would be possible for all C. But the assumption was made that A is not possible for all C.

We must understand 'that which belongs to all' with no limitation in respect of time, e.g. to the present or to a particular period, but simply without qualification. For it is by the help of such premisses that we make syllogisms, since if the premiss is understood with reference to the present moment, there cannot be a syllogism. For nothing perhaps prevents 'man' belonging at a particular time to everything that is moving, i.e. if nothing else were moving: but 'moving' is possible for every horse; yet 'man' is possible for no horse. Further let the major term be 'animal', the middle 'moving', the the minor 'man'. The premisses then will be as before, but the conclusion necessary, not possible. For man is necessarily animal. It is clear then that the universal must be understood simply, without limitation in respect of time.

Again let the premiss AB be universal and negative, and assume that A belongs to no B, but B possibly belongs to all C. These propositions being laid down, it is necessary that A possibly belongs to no C. Suppose that it cannot belong, and that B belongs to C, as above. It is necessary then that A belongs to some B: for we have a syllogism in the third figure: but this is impossible. Thus it will be possible for A to belong to no C; for if

at is supposed false, the consequence is an impossible one. This syllogism then does not establish that which is possible according to the definition, but that which does not necessarily belong to any part of the subject (for this is the contradictory of the assumption which was made: for it was supposed that A necessarily belongs to some C, but the syllogism per impossibile establishes the contradictory which is opposed to this). Further, it is clear also from an example that the conclusion will not establish possibility. Let A be 'raven', B 'intelligent', and C 'man'. A then belongs to no B: for no intelligent thing is a raven. But B is possible for all C: for every man may possibly be intelligent. But A necessarily belongs to no C: so the conclusion does not establish possibility. But neither is it always necessary. Let A be 'moving', B 'science', C 'man'. A then will belong to no B; but B is possible for all C. And the conclusion will not be necessary. For it is not necessary that no man should move; rather it is not necessary that any man should move. Clearly then the conclusion establishes that one term does not necessarily belong to any instance of another term. But we must take our terms better.

If the minor premiss is negative and indicates possibility, from the actual premisses taken there can be no syllogism, but if the problematic premiss is converted, a syllogism will be possible, as before. Let A belong to all B, and let B possibly belong to no C. If the terms are arranged thus, nothing necessarily follows: but if the proposition BC is converted and it is assumed that B is possible for all C, a syllogism results as before: for the terms are in the same relative positions. Likewise if both the relations are negative, if the major premiss states that A does not belong to B, and the minor premiss indicates that B may possibly belong to no C. Through the premisses actually taken nothing necessary results in any way; but if the problematic premiss is converted, we shall have a syllogism. Suppose that A belongs to no B, and B may possibly belong to no C. Through these comes nothing

necessary. But if B is assumed to be possible for all C (and this is true) and if the premiss AB remains as before, we shall again have the same syllogism. But if it be assumed that B does not belong to any C, instead of possibly not belonging, there cannot be a syllogism anyhow, whether the premiss AB is negative or affirmative. As common instances of a necessary and positive relation we may take the terms white – animal – snow: of a necessary and negative relation, white – animal – pitch. Clearly then if the terms are universal, and one of the premisses is assertoric, the other problematic, whenever the minor premiss is problematic a syllogism always results, only sometimes it results from the premisses that are taken, sometimes it requires the conversion of one premiss. We have stated when each of these happens and the reason why. But if one of the relations is universal, the other particular, then whenever the major premiss is universal and problematic, whether affirmative or negative, and the particular is affirmative and assertoric, there will be a perfect syllogism, just as when the terms are universal. The demonstration is the same as before. But whenever the major premiss is universal, but assertoric, not problematic, and the minor is particular and problematic, whether both premisses are negative or affirmative, or one is negative, the other affirmative, in all cases there will be an imperfect syllogism. Only some of them will be proved per impossibile, others by the conversion of the problematic premiss, as has been shown above. And a syllogism will be possible by means of conversion when the major premiss is universal and assertoric, whether positive or negative, and the minor particular, negative, and problematic, e.g. if A belongs to all B or to no B, and B may possibly not belong to some C. For if the premiss BC is converted in respect of possibility, a syllogism results. But whenever the particular premiss is assertoric and negative, there cannot be a syllogism. As instances of the positive relation we may take the terms white – animal – snow; of the negative,

white – animal – pitch. For the demonstration must be made through the indefinite nature of the particular premiss. But if the minor premiss is universal, and the major particular, whether either premiss is negative or affirmative, problematic or assertoric, nohow is a syllogism possible. Nor is a syllogism possible when the premisses are particular or indefinite, whether problematic or assertoric, or the one problematic, the other assertoric. The demonstration is the same as above. As instances of the necessary and positive relation we may take the terms animal – white – man; of the necessary and negative relation, animal – white – garment. It is evident then that if the major premiss is universal, a syllogism always results, but if the minor is universal nothing at all can ever be proved.

16

Whenever one premiss is necessary, the other problematic, there will be a syllogism when the terms are related as before; and a perfect syllogism when the minor premiss is necessary. If the premisses are affirmative the conclusion will be problematic, not assertoric, whether the premisses are universal or not: but if one is affirmative, the other negative, when the affirmative is necessary the conclusion will be problematic, not negative assertoric; but when the negative is necessary the conclusion will be problematic negative, and assertoric negative, whether the premisses are universal or not. Possibility in the conclusion must be understood in the same manner as before. There cannot be an inference to the necessary negative proposition: for 'not necessarily to belong' is different from 'necessarily not to belong'.

If the premisses are affirmative, clearly the conclusion which follows is not necessary. Suppose A necessarily belongs to all B, and let B be possible for all C. We shall have an imperfect syllogism to prove that A may belong to all C. That it is imperfect is clear from the proof: for it will be proved in the same manner as above. Again, let A be possible for all B, and let B necessarily belong to all C. We shall then have a syllogism to prove that A may belong to all C, not that A does belong to all C: and it is perfect, not imperfect: for it is completed directly through the original premisses.

But if the premisses are not similar in quality, suppose first that the negative premiss is necessary, and let necessarily A not be possible for any B, but let B be possible for all C. It is necessary then that A belongs to no C. For suppose A to belong to all C or to some C. Now we assumed that A is not possible for any B. Since then the negative proposition is convertible, B is not possible for any A. But A is supposed to belong to all C or to some C. Consequently B will not be possible for any C or for all C. But it was originally laid down that B is possible for all C. And it is clear that the possibility of belonging can be inferred, since the fact of not belonging is inferred. Again, let the affirmative premiss be necessary, and let A possibly not belong to any B, and let B necessarily belong to all C. The syllogism will be perfect, but it will establish a problematic negative, not an assertoric negative. For the major premiss was problematic, and further it is not possible to prove the assertoric conclusion per impossibile. For if it were supposed that A belongs to some C, and it is laid down that A possibly does not belong to any B, no impossible relation between B and C follows from these premisses. But if the minor premiss is negative, when it is problematic a syllogism is possible by conversion, as above; but when it is necessary no syllogism can be formed. Nor again when both premisses are negative, and the minor is necessary. The same terms as before serve both for the positive relation –

white-animal-snow, and for the negative relation – white-animal-pitch.

The same relation will obtain in particular syllogisms. Whenever the negative proposition is necessary, the conclusion will be negative assertoric: e.g. if it is not possible that A should belong to any B, but B may belong to some of the Cs, it is necessary that A should not belong to some of the Cs. For if A belongs to all C, but cannot belong to any B, neither can B belong to any A. So if A belongs to all C, to none of the Cs can B belong. But it was laid down that B may belong to some C. But when the particular affirmative in the negative syllogism, e.g. BC the minor premiss, or the universal proposition in the affirmative syllogism, e.g. AB the major premiss, is necessary, there will not be an assertoric conclusion. The demonstration is the same as before. But if the minor premiss is universal, and problematic, whether affirmative or negative, and the major premiss is particular and necessary, there cannot be a syllogism. Premisses of this kind are possible both where the relation is positive and necessary, e.g. animal-white-man, and where it is necessary and negative, e.g. animal-white-garment. But when the universal is necessary, the particular problematic, if the universal is negative we may take the terms animal-white-raven to illustrate the positive relation, or animal-white-pitch to illustrate the negative; and if the universal is affirmative we may take the terms animal-white-swan to illustrate the positive relation, and animal-white-snow to illustrate the negative and necessary relation. Nor again is a syllogism possible when the premisses are indefinite, or both particular. Terms applicable in either case to illustrate the positive relation are animal-white-man: to illustrate the negative, animal-white-inanimate. For the relation of animal to some white, and of white to some inanimate, is both necessary and positive and necessary and negative. Similarly if the relation is problematic: so the terms may be used for all cases.

Clearly then from what has been said a syllogism results or not from similar relations of the terms whether we are dealing with simple existence or necessity, with this exception, that if the negative premiss is assertoric the conclusion is problematic, but if the negative premiss is necessary the conclusion is both problematic and negative assertoric. [It is clear also that all the syllogisms are imperfect and are perfected by means of the figures above mentioned.]

17

In the second figure whenever both premisses are problematic, no syllogism is possible, whether the premisses are affirmative or negative, universal or particular. But when one premiss is assertoric, the other problematic, if the affirmative is assertoric no syllogism is possible, but if the universal negative is assertoric a conclusion can always be drawn. Similarly when one premiss is necessary, the other problematic. Here also we must understand the term 'possible' in the conclusion, in the same sense as before.

First we must point out that the negative problematic proposition is not convertible, e.g. if A may belong to no B, it does not follow that B may belong to no A. For suppose it to follow and assume that B may belong to no A. Since then problematic affirmations are convertible with negations, whether they are contraries or contradictories, and since B may belong to no A, it is clear that B may belong to all A. But this is false: for if all this can be that, it does not follow that all that can be this: consequently the negative proposition is not convertible. Further, these propositions are not incompatible, 'A may belong to no B', 'B necessarily does not belong to some of

the As'; e.g. it is possible that no man should be white (for it is also possible that every man should be white), but it is not true to say that it is possible that no white thing should be a man: for many white things are necessarily not men, and the necessary (as we saw) other than the possible.

Moreover it is not possible to prove the convertibility of these propositions by a reductio ad absurdum, i.e. by claiming assent to the following argument: 'since it is false that B may belong to no A, it is true that it cannot belong to no A, for the one statement is the contradictory of the other. But if this is so, it is true that B necessarily belongs to some of the As: consequently A necessarily belongs to some of the Bs. But this is impossible.' The argument cannot be admitted, for it does not follow that some A is necessarily B, if it is not possible that no A should be B. For the latter expression is used in two senses, one if A some is necessarily B, another if some A is necessarily not B. For it is not true to say that that which necessarily does not belong to some of the As may possibly not belong to any A, just as it is not true to say that what necessarily belongs to some A may possibly belong to all A. If any one then should claim that because it is not possible for C to belong to all D, it necessarily does not belong to some D, he would make a false assumption: for it does belong to all D, but because in some cases it belongs necessarily, therefore we say that it is not possible for it to belong to all. Hence both the propositions 'A necessarily belongs to some B' and 'A necessarily does not belong to some B' are opposed to the proposition 'A belongs to all B'. Similarly also they are opposed to the proposition 'A may belong to no B'. It is clear then that in relation to what is possible and not possible, in the sense originally defined, we must assume, not that A necessarily belongs to some B, but that A necessarily does not belong to some B. But if this is assumed, no absurdity results: consequently no syllogism. It is clear from what has been said that the negative proposition is not convertible.

This being proved, suppose it possible that A may belong to no B and to all C. By means of conversion no syllogism will result: for the major premiss, as has been said, is not convertible. Nor can a proof be obtained by a reductio ad absurdum: for if it is assumed that B can belong to all C, no false consequence results: for A may belong both to all C and to no C. In general, if there is a syllogism, it is clear that its conclusion will be problematic because neither of the premisses is assertoric; and this must be either affirmative or negative. But neither is possible. Suppose the conclusion is affirmative: it will be proved by an example that the predicate cannot belong to the subject. Suppose the conclusion is negative: it will be proved that it is not problematic but necessary. Let A be white, B man, C horse. It is possible then for A to belong to all of the one and to none of the other. But it is not possible for B to belong nor not to belong to C. That it is not possible for it to belong, is clear. For no horse is a man. Neither is it possible for it not to belong. For it is necessary that no horse should be a man, but the necessary we found to be different from the possible. No syllogism then results. A similar proof can be given if the major premiss is negative, the minor affirmative, or if both are affirmative or negative. The demonstration can be made by means of the same terms. And whenever one premiss is universal, the other particular, or both are particular or indefinite, or in whatever other way the premisses can be altered, the proof will always proceed through the same terms. Clearly then, if both the premisses are problematic, no syllogism results.

18

But if one premiss is assertoric, the other problematic, if the affirmative is assertoric and the negative problematic no

syllogism will be possible, whether the premisses are universal or particular. The proof is the same as above, and by means of the same terms. But when the affirmative premiss is problematic, and the negative assertoric, we shall have a syllogism. Suppose A belongs to no B, but can belong to all C. If the negative proposition is converted, B will belong to no A. But ex hypothesi can belong to all C: so a syllogism is made, proving by means of the first figure that B may belong to no C. Similarly also if the minor premiss is negative. But if both premisses are negative, one being assertoric, the other problematic, nothing follows necessarily from these premisses as they stand, but if the problematic premiss is converted into its complementary affirmative a syllogism is formed to prove that B may belong to no C, as before: for we shall again have the first figure. But if both premisses are affirmative, no syllogism will be possible. This arrangement of terms is possible both when the relation is positive, e.g. health, animal, man, and when it is negative, e.g. health, horse, man.

The same will hold good if the syllogisms are particular. Whenever the affirmative proposition is assertoric, whether universal or particular, no syllogism is possible (this is proved similarly and by the same examples as above), but when the negative proposition is assertoric, a conclusion can be drawn by means of conversion, as before. Again if both the relations are negative, and the assertoric proposition is universal, although no conclusion follows from the actual premisses, a syllogism can be obtained by converting the problematic premiss into its complementary affirmative as before. But if the negative proposition is assertoric, but particular, no syllogism is possible, whether the other premiss is affirmative or negative. Nor can a conclusion be drawn when both premisses are indefinite, whether affirmative or negative, or particular. The proof is the same and by the same terms.

19

If one of the premisses is necessary, the other problematic, then if the negative is necessary a syllogistic conclusion can be drawn, not merely a negative problematic but also a negative assertoric conclusion; but if the affirmative premiss is necessary, no conclusion is possible. Suppose that A necessarily belongs to no B, but may belong to all C. If the negative premiss is converted B will belong to no A: but A ex hypothesi is capable of belonging to all C: so once more a conclusion is drawn by the first figure that B may belong to no C. But at the same time it is clear that B will not belong to any C. For assume that it does: then if A cannot belong to any B, and B belongs to some of the Cs, A cannot belong to some of the Cs: but ex hypothesi it may belong to all. A similar proof can be given if the minor premiss is negative. Again let the affirmative proposition be necessary, and the other problematic; i.e. suppose that A may belong to no B, but necessarily belongs to all C. When the terms are arranged in this way, no syllogism is possible. For (1) it sometimes turns out that B necessarily does not belong to C. Let A be white, B man, C swan. White then necessarily belongs to swan, but may belong to no man; and man necessarily belongs to no swan; Clearly then we cannot draw a problematic conclusion; for that which is necessary is admittedly distinct from that which is possible. (2) Nor again can we draw a necessary conclusion: for that presupposes that both premisses are necessary, or at any rate the negative premiss. (3) Further it is possible also, when the terms are so arranged, that B should belong to C: for nothing prevents C falling under B, A being possible for all B, and necessarily belonging to C; e.g. if C stands for 'awake', B for 'animal', A for 'motion'. For motion necessarily belongs to what

is awake, and is possible for every animal: and everything that is awake is animal. Clearly then the conclusion cannot be the negative assertion, if the relation must be positive when the terms are related as above. Nor can the opposite affirmations be established: consequently no syllogism is possible. A similar proof is possible if the major premiss is affirmative.

But if the premisses are similar in quality, when they are negative a syllogism can always be formed by converting the problematic premiss into its complementary affirmative as before. Suppose A necessarily does not belong to B, and possibly may not belong to C: if the premisses are converted B belongs to no A, and A may possibly belong to all C: thus we have the first figure. Similarly if the minor premiss is negative. But if the premisses are affirmative there cannot be a syllogism. Clearly the conclusion cannot be a negative assertoric or a negative necessary proposition because no negative premiss has been laid down either in the assertoric or in the necessary mode. Nor can the conclusion be a problematic negative proposition. For if the terms are so related, there are cases in which B necessarily will not belong to C; e.g. suppose that A is white, B swan, C man. Nor can the opposite affirmations be established, since we have shown a case in which B necessarily does not belong to C. A syllogism then is not possible at all.

Similar relations will obtain in particular syllogisms. For whenever the negative proposition is universal and necessary, a syllogism will always be possible to prove both a problematic and a negative assertoric proposition (the proof proceeds by conversion); but when the affirmative proposition is universal and necessary, no syllogistic conclusion can be drawn. This can be proved in the same way as for universal propositions, and by the same terms. Nor is a syllogistic conclusion possible when both premisses are affirmative: this also may be proved as above. But when both premisses are negative, and the premiss

that definitely disconnects two terms is universal and necessary, though nothing follows necessarily from the premisses as they are stated, a conclusion can be drawn as above if the problematic premiss is converted into its complementary affirmative. But if both are indefinite or particular, no syllogism can be formed. The same proof will serve, and the same terms.

It is clear then from what has been said that if the universal and negative premiss is necessary, a syllogism is always possible, proving not merely a negative problematic, but also a negative assertoric proposition; but if the affirmative premiss is necessary no conclusion can be drawn. It is clear too that a syllogism is possible or not under the same conditions whether the mode of the premisses is assertoric or necessary. And it is clear that all the syllogisms are imperfect, and are completed by means of the figures mentioned.

20

In the last figure a syllogism is possible whether both or only one of the premisses is problematic. When the premisses are problematic the conclusion will be problematic; and also when one premiss is problematic, the other assertoric. But when the other premiss is necessary, if it is affirmative the conclusion will be neither necessary or assertoric; but if it is negative the syllogism will result in a negative assertoric proposition, as above. In these also we must understand the expression 'possible' in the conclusion in the same way as before.

First let the premisses be problematic and suppose that both A and B may possibly belong to every C. Since then the affirmative proposition is convertible into a particular, and B may possibly

belong to every C, it follows that C may possibly belong to some B. So, if A is possible for every C, and C is possible for some of the Bs, then A is possible for some of the Bs. For we have got the first figure. And A if may possibly belong to no C, but B may possibly belong to all C, it follows that A may possibly not belong to some B: for we shall have the first figure again by conversion. But if both premisses should be negative no necessary consequence will follow from them as they are stated, but if the premisses are converted into their corresponding affirmatives there will be a syllogism as before. For if A and B may possibly not belong to C, if 'may possibly belong' is substituted we shall again have the first figure by means of conversion. But if one of the premisses is universal, the other particular, a syllogism will be possible, or not, under the arrangement of the terms as in the case of assertoric propositions. Suppose that A may possibly belong to all C, and B to some C. We shall have the first figure again if the particular premiss is converted. For if A is possible for all C, and C for some of the Bs, then A is possible for some of the Bs. Similarly if the proposition BC is universal. Likewise also if the proposition AC is negative, and the proposition BC affirmative: for we shall again have the first figure by conversion. But if both premisses should be negative – the one universal and the other particular – although no syllogistic conclusion will follow from the premisses as they are put, it will follow if they are converted, as above. But when both premisses are indefinite or particular, no syllogism can be formed: for A must belong sometimes to all B and sometimes to no B. To illustrate the affirmative relation take the terms animal-man-white; to illustrate the negative, take the terms horse-man-white – white being the middle term.

21

If one premiss is pure, the other problematic, the conclusion will be problematic, not pure; and a syllogism will be possible under the same arrangement of the terms as before. First let the premisses be affirmative: suppose that A belongs to all C, and B may possibly belong to all C. If the proposition BC is converted, we shall have the first figure, and the conclusion that A may possibly belong to some of the Bs. For when one of the premisses in the first figure is problematic, the conclusion also (as we saw) is problematic. Similarly if the proposition BC is pure, AC problematic; or if AC is negative, BC affirmative, no matter which of the two is pure; in both cases the conclusion will be problematic: for the first figure is obtained once more, and it has been proved that if one premiss is problematic in that figure the conclusion also will be problematic. But if the minor premiss BC is negative, or if both premisses are negative, no syllogistic conclusion can be drawn from the premisses as they stand, but if they are converted a syllogism is obtained as before.

If one of the premisses is universal, the other particular, then when both are affirmative, or when the universal is negative, the particular affirmative, we shall have the same sort of syllogisms: for all are completed by means of the first figure. So it is clear that we shall have not a pure but a problematic syllogistic conclusion. But if the affirmative premiss is universal, the negative particular, the proof will proceed by a reductio ad impossibile. Suppose that B belongs to all C, and A may possibly not belong to some C: it follows that may possibly not belong to some B. For if A necessarily belongs to all B, and B (as has been assumed) belongs to all C, A will necessarily belong to all C: for this has been proved before. But it was assumed at the outset that A may possibly not belong to some C.

Whenever both premisses are indefinite or particular, no syllogism will be possible. The demonstration is the same as was given in the case of universal premisses, and proceeds by means of the same terms.

22

If one of the premisses is necessary, the other problematic, when the premisses are affirmative a problematic affirmative conclusion can always be drawn; when one proposition is affirmative, the other negative, if the affirmative is necessary a problematic negative can be inferred; but if the negative proposition is necessary both a problematic and a pure negative conclusion are possible. But a necessary negative conclusion will not be possible, any more than in the other figures. Suppose first that the premisses are affirmative, i.e. that A necessarily belongs to all C, and B may possibly belong to all C. Since then A must belong to all C, and C may belong to some B, it follows that A may (not does) belong to some B: for so it resulted in the first figure. A similar proof may be given if the proposition BC is necessary, and AC is problematic. Again suppose one proposition is affirmative, the other negative, the affirmative being necessary: i.e. suppose A may possibly belong to no C, but B necessarily belongs to all C. We shall have the first figure once more: and – since the negative premiss is problematic – it is clear that the conclusion will be problematic: for when the premisses stand thus in the first figure, the conclusion (as we found) is problematic. But if the negative premiss is necessary, the conclusion will be not only that A may possibly not belong to some B but also that it does not belong to some B. For suppose that A necessarily does not belong to C, but B may belong to all C. If the affirmative proposition BC is converted, we

shall have the first figure, and the negative premiss is necessary. But when the premisses stood thus, it resulted that A might possibly not belong to some C, and that it did not belong to some C; consequently here it follows that A does not belong to some B. But when the minor premiss is negative, if it is problematic we shall have a syllogism by altering the premiss into its complementary affirmative, as before; but if it is necessary no syllogism can be formed. For A sometimes necessarily belongs to all B, and sometimes cannot possibly belong to any B. To illustrate the former take the terms sleep-sleeping horse-man; to illustrate the latter take the terms sleep-waking horse-man.

Similar results will obtain if one of the terms is related universally to the middle, the other in part. If both premisses are affirmative, the conclusion will be problematic, not pure; and also when one premiss is negative, the other affirmative, the latter being necessary. But when the negative premiss is necessary, the conclusion also will be a pure negative proposition; for the same kind of proof can be given whether the terms are universal or not. For the syllogisms must be made perfect by means of the first figure, so that a result which follows in the first figure follows also in the third. But when the minor premiss is negative and universal, if it is problematic a syllogism can be formed by means of conversion; but if it is necessary a syllogism is not possible. The proof will follow the same course as where the premisses are universal; and the same terms may be used.

It is clear then in this figure also when and how a syllogism can be formed, and when the conclusion is problematic, and when it is pure. It is evident also that all syllogisms in this figure are imperfect, and that they are made perfect by means of the first figure.

23

It is clear from what has been said that the syllogisms in these figures are made perfect by means of universal syllogisms in the first figure and are reduced to them. That every syllogism without qualification can be so treated, will be clear presently, when it has been proved that every syllogism is formed through one or other of these figures.

It is necessary that every demonstration and every syllogism should prove either that something belongs or that it does not, and this either universally or in part, and further either ostensively or hypothetically. One sort of hypothetical proof is the reductio ad impossibile. Let us speak first of ostensive syllogisms: for after these have been pointed out the truth of our contention will be clear with regard to those which are proved per impossibile, and in general hypothetically.

If then one wants to prove syllogistically A of B, either as an attribute of it or as not an attribute of it, one must assert something of something else. If now A should be asserted of B, the proposition originally in question will have been assumed. But if A should be asserted of C, but C should not be asserted of anything, nor anything of it, nor anything else of A, no syllogism will be possible. For nothing necessarily follows from the assertion of some one thing concerning some other single thing. Thus we must take another premiss as well. If then A be asserted of something else, or something else of A, or something different of C, nothing prevents a syllogism being formed, but it will not be in relation to B through the premisses taken. Nor when C belongs to something else, and that to something else and so on, no connexion however being made

with B, will a syllogism be possible concerning A in its relation to B. For in general we stated that no syllogism can establish the attribution of one thing to another, unless some middle term is taken, which is somehow related to each by way of predication. For the syllogism in general is made out of premisses, and a syllogism referring to this out of premisses with the same reference, and a syllogism relating this to that proceeds through premisses which relate this to that. But it is impossible to take a premiss in reference to B, if we neither affirm nor deny anything of it; or again to take a premiss relating A to B, if we take nothing common, but affirm or deny peculiar attributes of each. So we must take something midway between the two, which will connect the predications, if we are to have a syllogism relating this to that. If then we must take something common in relation to both, and this is possible in three ways (either by predicating A of C, and C of B, or C of both, or both of C), and these are the figures of which we have spoken, it is clear that every syllogism must be made in one or other of these figures. The argument is the same if several middle terms should be necessary to establish the relation to B; for the figure will be the same whether there is one middle term or many.

It is clear then that the ostensive syllogisms are effected by means of the aforesaid figures; these considerations will show that reductiones ad also are effected in the same way. For all who effect an argument per impossibile infer syllogistically what is false, and prove the original conclusion hypothetically when something impossible results from the assumption of its contradictory; e.g. that the diagonal of the square is incommensurate with the side, because odd numbers are equal to evens if it is supposed to be commensurate. One infers syllogistically that odd numbers come out equal to evens, and one proves hypothetically the incommensurability of the diagonal, since a falsehood results through contradicting this. For this we found to be reasoning per impossibile, viz. proving

something impossible by means of an hypothesis conceded at the beginning. Consequently, since the falsehood is established in reductions ad impossibile by an ostensive syllogism, and the original conclusion is proved hypothetically, and we have already stated that ostensive syllogisms are effected by means of these figures, it is evident that syllogisms per impossibile also will be made through these figures. Likewise all the other hypothetical syllogisms: for in every case the syllogism leads up to the proposition that is substituted for the original thesis; but the original thesis is reached by means of a concession or some other hypothesis. But if this is true, every demonstration and every syllogism must be formed by means of the three figures mentioned above. But when this has been shown it is clear that every syllogism is perfected by means of the first figure and is reducible to the universal syllogisms in this figure.

24

Further in every syllogism one of the premisses must be affirmative, and universality must be present: unless one of the premisses is universal either a syllogism will not be possible, or it will not refer to the subject proposed, or the original position will be begged. Suppose we have to prove that pleasure in music is good. If one should claim as a premiss that pleasure is good without adding 'all', no syllogism will be possible; if one should claim that some pleasure is good, then if it is different from pleasure in music, it is not relevant to the subject proposed; if it is this very pleasure, one is assuming that which was proposed at the outset to be proved. This is more obvious in geometrical proofs, e.g. that the angles at the base of an isosceles triangle are equal. Suppose the lines A and B have been drawn to the centre. If then one should assume that the angle AC is equal to

the angle BD, without claiming generally that angles of semicircles are equal; and again if one should assume that the angle C is equal to the angle D, without the additional assumption that every angle of a segment is equal to every other angle of the same segment; and further if one should assume that when equal angles are taken from the whole angles, which are themselves equal, the remainders E and F are equal, he will beg the thing to be proved, unless he also states that when equals are taken from equals the remainders are equal.

It is clear then that in every syllogism there must be a universal premiss, and that a universal statement is proved only when all the premisses are universal, while a particular statement is proved both from two universal premisses and from one only: consequently if the conclusion is universal, the premisses also must be universal, but if the premisses are universal it is possible that the conclusion may not be universal. And it is clear also that in every syllogism either both or one of the premisses must be like the conclusion. I mean not only in being affirmative or negative, but also in being necessary, pure, problematic. We must consider also the other forms of predication.

It is clear also when a syllogism in general can be made and when it cannot; and when a valid, when a perfect syllogism can be formed; and that if a syllogism is formed the terms must be arranged in one of the ways that have been mentioned.

25

It is clear too that every demonstration will proceed through three terms and no more, unless the same conclusion is

established by different pairs of propositions; e.g. the conclusion E may be established through the propositions A and B, and through the propositions C and D, or through the propositions A and B, or A and C, or B and C. For nothing prevents there being several middles for the same terms. But in that case there is not one but several syllogisms. Or again when each of the propositions A and B is obtained by syllogistic inference, e.g. by means of D and E, and again B by means of F and G. Or one may be obtained by syllogistic, the other by inductive inference. But thus also the syllogisms are many; for the conclusions are many, e.g. A and B and C. But if this can be called one syllogism, not many, the same conclusion may be reached by more than three terms in this way, but it cannot be reached as C is established by means of A and B. Suppose that the proposition E is inferred from the premisses A, B, C, and D. It is necessary then that of these one should be related to another as whole to part: for it has already been proved that if a syllogism is formed some of its terms must be related in this way. Suppose then that A stands in this relation to B. Some conclusion then follows from them. It must either be E or one or other of C and D, or something other than these.

(1) If it is E the syllogism will have A and B for its sole premisses. But if C and D are so related that one is whole, the other part, some conclusion will follow from them also; and it must be either E, or one or other of the propositions A and B, or something other than these. And if it is (i) E, or (ii) A or B, either (i) the syllogisms will be more than one, or (ii) the same thing happens to be inferred by means of several terms only in the sense which we saw to be possible. But if (iii) the conclusion is other than E or A or B, the syllogisms will be many, and unconnected with one another. But if C is not so related to D as to make a syllogism, the propositions will have been assumed to no purpose, unless for the sake of induction or of obscuring the argument or something of the sort.

(2) But if from the propositions A and B there follows not E but some other conclusion, and if from C and D either A or B follows or something else, then there are several syllogisms, and they do not establish the conclusion proposed: for we assumed that the syllogism proved E. And if no conclusion follows from C and D, it turns out that these propositions have been assumed to no purpose, and the syllogism does not prove the original proposition.

So it is clear that every demonstration and every syllogism will proceed through three terms only.

This being evident, it is clear that a syllogistic conclusion follows from two premisses and not from more than two. For the three terms make two premisses, unless a new premiss is assumed, as was said at the beginning, to perfect the syllogisms. It is clear therefore that in whatever syllogistic argument the premisses through which the main conclusion follows (for some of the preceding conclusions must be premisses) are not even in number, this argument either has not been drawn syllogistically or it has assumed more than was necessary to establish its thesis.

If then syllogisms are taken with respect to their main premisses, every syllogism will consist of an even number of premisses and an odd number of terms (for the terms exceed the premisses by one), and the conclusions will be half the number of the premisses. But whenever a conclusion is reached by means of prosyllogisms or by means of several continuous middle terms, e.g. the proposition AB by means of the middle terms C and D, the number of the terms will similarly exceed that of the premisses by one (for the extra term must either be added outside or inserted: but in either case it follows that the relations of predication are one fewer than the terms related), and the premisses will be equal in number to the relations of

predication. The premisses however will not always be even, the terms odd; but they will alternate – when the premisses are even, the terms must be odd; when the terms are even, the premisses must be odd: for along with one term one premiss is added, if a term is added from any quarter. Consequently since the premisses were (as we saw) even, and the terms odd, we must make them alternately even and odd at each addition. But the conclusions will not follow the same arrangement either in respect to the terms or to the premisses. For if one term is added, conclusions will be added less by one than the pre-existing terms: for the conclusion is drawn not in relation to the single term last added, but in relation to all the rest, e.g. if to ABC the term D is added, two conclusions are thereby added, one in relation to A, the other in relation to B. Similarly with any further additions. And similarly too if the term is inserted in the middle: for in relation to one term only, a syllogism will not be constructed. Consequently the conclusions will be much more numerous than the terms or the premisses.

26

Since we understand the subjects with which syllogisms are concerned, what sort of conclusion is established in each figure, and in how many moods this is done, it is evident to us both what sort of problem is difficult and what sort is easy to prove. For that which is concluded in many figures and through many moods is easier; that which is concluded in few figures and through few moods is more difficult to attempt. The universal affirmative is proved by means of the first figure only and by this in only one mood; the universal negative is proved both through the first figure and through the second, through the first in one mood, through the second in two. The particular

affirmative is proved through the first and through the last figure, in one mood through the first, in three moods through the last. The particular negative is proved in all the figures, but once in the first, in two moods in the second, in three moods in the third. It is clear then that the universal affirmative is most difficult to establish, most easy to overthrow. In general, universals are easier game for the destroyer than particulars: for whether the predicate belongs to none or not to some, they are destroyed: and the particular negative is proved in all the figures, the universal negative in two. Similarly with universal negatives: the original statement is destroyed, whether the predicate belongs to all or to some: and this we found possible in two figures. But particular statements can be refuted in one way only – by proving that the predicate belongs either to all or to none. But particular statements are easier to establish: for proof is possible in more figures and through more moods. And in general we must not forget that it is possible to refute statements by means of one another, I mean, universal statements by means of particular, and particular statements by means of universal: but it is not possible to establish universal statements by means of particular, though it is possible to establish particular statements by means of universal. At the same time it is evident that it is easier to refute than to establish.

The manner in which every syllogism is produced, the number of the terms and premisses through which it proceeds, the relation of the premisses to one another, the character of the problem proved in each figure, and the number of the figures appropriate to each problem, all these matters are clear from what has been said.

27

We must now state how we may ourselves always have a supply of syllogisms in reference to the problem proposed and by what road we may reach the principles relative to the problem: for perhaps we ought not only to investigate the construction of syllogisms, but also to have the power of making them.

Of all the things which exist some are such that they cannot be predicated of anything else truly and universally, e.g. Cleon and Callias, i.e. the individual and sensible, but other things may be predicated of them (for each of these is both man and animal); and some things are themselves predicated of others, but nothing prior is predicated of them; and some are predicated of others, and yet others of them, e.g. man of Callias and animal of man. It is clear then that some things are naturally not stated of anything: for as a rule each sensible thing is such that it cannot be predicated of anything, save incidentally: for we sometimes say that that white object is Socrates, or that that which approaches is Callias. We shall explain in another place that there is an upward limit also to the process of predicating: for the present we must assume this. Of these ultimate predicates it is not possible to demonstrate another predicate, save as a matter of opinion, but these may be predicated of other things. Neither can individuals be predicated of other things, though other things can be predicated of them. Whatever lies between these limits can be spoken of in both ways: they may be stated of others, and others stated of them. And as a rule arguments and inquiries are concerned with these things. We must select the premisses suitable to each problem in this manner: first we must lay down the subject and the definitions and the properties of the thing; next we must lay down those attributes which follow the thing, and again those which the thing follows, and those which cannot belong to it. But those to which it cannot belong need not be selected, because the negative

statement implied above is convertible. Of the attributes which follow we must distinguish those which fall within the definition, those which are predicated as properties, and those which are predicated as accidents, and of the latter those which apparently and those which really belong. The larger the supply a man has of these, the more quickly will he reach a conclusion; and in proportion as he apprehends those which are truer, the more cogently will he demonstrate. But he must select not those which follow some particular but those which follow the thing as a whole, e.g. not what follows a particular man but what follows every man: for the syllogism proceeds through universal premisses. If the statement is indefinite, it is uncertain whether the premiss is universal, but if the statement is definite, the matter is clear. Similarly one must select those attributes which the subject follows as wholes, for the reason given. But that which follows one must not suppose to follow as a whole, e.g. that every animal follows man or every science music, but only that it follows, without qualification, and indeed we state it in a proposition: for the other statement is useless and impossible, e.g. that every man is every animal or justice is all good. But that which something follows receives the mark 'every'. Whenever the subject, for which we must obtain the attributes that follow, is contained by something else, what follows or does not follow the highest term universally must not be selected in dealing with the subordinate term (for these attributes have been taken in dealing with the superior term; for what follows animal also follows man, and what does not belong to animal does not belong to man); but we must choose those attributes which are peculiar to each subject. For some things are peculiar to the species as distinct from the genus; for species being distinct there must be attributes peculiar to each. Nor must we take as things which the superior term follows, those things which the inferior term follows, e.g. take as subjects of the predicate 'animal' what are really subjects of the

predicate 'man'. It is necessary indeed, if animal follows man, that it should follow all these also. But these belong more properly to the choice of what concerns man. One must apprehend also normal consequents and normal antecedents – for propositions which obtain normally are established syllogistically from premisses which obtain normally, some if not all of them having this character of normality. For the conclusion of each syllogism resembles its principles. We must not however choose attributes which are consequent upon all the terms: for no syllogism can be made out of such premisses. The reason why this is so will be clear in the sequel.

28

If men wish to establish something about some whole, they must look to the subjects of that which is being established (the subjects of which it happens to be asserted), and the attributes which follow that of which it is to be predicated. For if any of these subjects is the same as any of these attributes, the attribute originally in question must belong to the subject originally in question. But if the purpose is to establish not a universal but a particular proposition, they must look for the terms of which the terms in question are predicable: for if any of these are identical, the attribute in question must belong to some of the subject in question. Whenever the one term has to belong to none of the other, one must look to the consequents of the subject, and to those attributes which cannot possibly be present in the predicate in question: or conversely to the attributes which cannot possibly be present in the subject, and to the consequents of the predicate. If any members of these groups are identical, one of the terms in question cannot possibly belong to any of the other. For sometimes a syllogism

in the first figure results, sometimes a syllogism in the second. But if the object is to establish a particular negative proposition, we must find antecedents of the subject in question and attributes which cannot possibly belong to the predicate in question. If any members of these two groups are identical, it follows that one of the terms in question does not belong to some of the other. Perhaps each of these statements will become clearer in the following way. Suppose the consequents of A are designated by B, the antecedents of A by C, attributes which cannot possibly belong to A by D. Suppose again that the attributes of E are designated by F, the antecedents of E by G, and attributes which cannot belong to E by H. If then one of the Cs should be identical with one of the Fs, A must belong to all E: for F belongs to all E, and A to all C, consequently A belongs to all E. If C and G are identical, A must belong to some of the Es: for A follows C, and E follows all G. If F and D are identical, A will belong to none of the Es by a prosyllogism: for since the negative proposition is convertible, and F is identical with D, A will belong to none of the Fs, but F belongs to all E. Again, if B and H are identical, A will belong to none of the Es: for B will belong to all A, but to no E: for it was assumed to be identical with H, and H belonged to none of the Es. If D and G are identical, A will not belong to some of the Es: for it will not belong to G, because it does not belong to D: but G falls under E: consequently A will not belong to some of the Es. If B is identical with G, there will be a converted syllogism: for E will belong to all A since B belongs to A and E to B (for B was found to be identical with G): but that A should belong to all E is not necessary, but it must belong to some E because it is possible to convert the universal statement into a particular.

It is clear then that in every proposition which requires proof we must look to the aforesaid relations of the subject and predicate in question: for all syllogisms proceed through these. But if we are seeking consequents and antecedents we must

look for those which are primary and most universal, e.g. in reference to E we must look to KF rather than to F alone, and in reference to A we must look to KC rather than to C alone. For if A belongs to KF, it belongs both to F and to E: but if it does not follow KF, it may yet follow F. Similarly we must consider the antecedents of A itself: for if a term follows the primary antecedents, it will follow those also which are subordinate, but if it does not follow the former, it may yet follow the latter.

It is clear too that the inquiry proceeds through the three terms and the two premisses, and that all the syllogisms proceed through the aforesaid figures. For it is proved that A belongs to all E, whenever an identical term is found among the Cs and Fs. This will be the middle term; A and E will be the extremes. So the first figure is formed. And A will belong to some E, whenever C and G are apprehended to be the same. This is the last figure: for G becomes the middle term. And A will belong to no E, when D and F are identical. Thus we have both the first figure and the middle figure; the first, because A belongs to no F, since the negative statement is convertible, and F belongs to all E: the middle figure because D belongs to no A, and to all E. And A will not belong to some E, whenever D and G are identical. This is the last figure: for A will belong to no G, and E will belong to all G. Clearly then all syllogisms proceed through the aforesaid figures, and we must not select consequents of all the terms, because no syllogism is produced from them. For (as we saw) it is not possible at all to establish a proposition from consequents, and it is not possible to refute by means of a consequent of both the terms in question: for the middle term must belong to the one, and not belong to the other.

It is clear too that other methods of inquiry by selection of middle terms are useless to produce a syllogism, e.g. if the consequents of the terms in question are identical, or if the antecedents of A are identical with those attributes which

cannot possibly belong to E, or if those attributes are identical which cannot belong to either term: for no syllogism is produced by means of these. For if the consequents are identical, e.g. B and F, we have the middle figure with both premisses affirmative: if the antecedents of A are identical with attributes which cannot belong to E, e.g. C with H, we have the first figure with its minor premiss negative. If attributes which cannot belong to either term are identical, e.g. C and H, both premisses are negative, either in the first or in the middle figure. But no syllogism is possible in this way.

It is evident too that we must find out which terms in this inquiry are identical, not which are different or contrary, first because the object of our investigation is the middle term, and the middle term must be not diverse but identical. Secondly, wherever it happens that a syllogism results from taking contraries or terms which cannot belong to the same thing, all arguments can be reduced to the aforesaid moods, e.g. if B and F are contraries or cannot belong to the same thing. For if these are taken, a syllogism will be formed to prove that A belongs to none of the Es, not however from the premisses taken but in the aforesaid mood. For B will belong to all A and to no E. Consequently B must be identical with one of the Hs. Again, if B and G cannot belong to the same thing, it follows that A will not belong to some of the Es: for then too we shall have the middle figure: for B will belong to all A and to no G. Consequently B must be identical with some of the Hs. For the fact that B and G cannot belong to the same thing differs in no way from the fact that B is identical with some of the Hs: for that includes everything which cannot belong to E.

It is clear then that from the inquiries taken by themselves no syllogism results; but if B and F are contraries B must be identical with one of the Hs, and the syllogism results through these terms. It turns out then that those who inquire in this

manner are looking gratuitously for some other way than the necessary way because they have failed to observe the identity of the Bs with the Hs.

29

Syllogisms which lead to impossible conclusions are similar to ostensive syllogisms; they also are formed by means of the consequents and antecedents of the terms in question. In both cases the same inquiry is involved. For what is proved ostensively may also be concluded syllogistically per impossibile by means of the same terms; and what is proved per impossibile may also be proved ostensively, e.g. that A belongs to none of the Es. For suppose A to belong to some E: then since B belongs to all A and A to some of the Es, B will belong to some of the Es: but it was assumed that it belongs to none. Again we may prove that A belongs to some E: for if A belonged to none of the Es, and E belongs to all G, A will belong to none of the Gs: but it was assumed to belong to all. Similarly with the other propositions requiring proof. The proof per impossibile will always and in all cases be from the consequents and antecedents of the terms in question. Whatever the problem the same inquiry is necessary whether one wishes to use an ostensive syllogism or a reduction to impossibility. For both the demonstrations start from the same terms, e.g. suppose it has been proved that A belongs to no E, because it turns out that otherwise B belongs to some of the Es and this is impossible – if now it is assumed that B belongs to no E and to all A, it is clear that A will belong to no E. Again if it has been proved by an ostensive syllogism that A belongs to no E, assume that A belongs to some E and it will be proved per impossibile to belong to no E. Similarly with the rest. In all cases

it is necessary to find some common term other than the subjects of inquiry, to which the syllogism establishing the false conclusion may relate, so that if this premiss is converted, and the other remains as it is, the syllogism will be ostensive by means of the same terms. For the ostensive syllogism differs from the reductio ad impossibile in this: in the ostensive syllogism both remisses are laid down in accordance with the truth, in the reductio ad impossibile one of the premisses is assumed falsely.

These points will be made clearer by the sequel, when we discuss the reduction to impossibility: at present this much must be clear, that we must look to terms of the kinds mentioned whether we wish to use an ostensive syllogism or a reduction to impossibility. In the other hypothetical syllogisms, I mean those which proceed by substitution, or by positing a certain quality, the inquiry will be directed to the terms of the problem to be proved – not the terms of the original problem, but the new terms introduced; and the method of the inquiry will be the same as before. But we must consider and determine in how many ways hypothetical syllogisms are possible.

Each of the problems then can be proved in the manner described; but it is possible to establish some of them syllogistically in another way, e.g. universal problems by the inquiry which leads up to a particular conclusion, with the addition of an hypothesis. For if the Cs and the Gs should be identical, but E should be assumed to belong to the Gs only, then A would belong to every E: and again if the Ds and the Gs should be identical, but E should be predicated of the Gs only, it follows that A will belong to none of the Es. Clearly then we must consider the matter in this way also. The method is the same whether the relation is necessary or possible. For the inquiry will be the same, and the syllogism will proceed through terms arranged in the same order whether a possible or a pure

proposition is proved. We must find in the case of possible relations, as well as terms that belong, terms which can belong though they actually do not: for we have proved that the syllogism which establishes a possible relation proceeds through these terms as well. Similarly also with the other modes of predication.

It is clear then from what has been said not only that all syllogisms can be formed in this way, but also that they cannot be formed in any other. For every syllogism has been proved to be formed through one of the aforementioned figures, and these cannot be composed through other terms than the consequents and antecedents of the terms in question: for from these we obtain the premisses and find the middle term. Consequently a syllogism cannot be formed by means of other terms.

30

The method is the same in all cases, in philosophy, in any art or study. We must look for the attributes and the subjects of both our terms, and we must supply ourselves with as many of these as possible, and consider them by means of the three terms, refuting statements in one way, confirming them in another, in the pursuit of truth starting from premisses in which the arrangement of the terms is in accordance with truth, while if we look for dialectical syllogisms we must start from probable premisses. The principles of syllogisms have been stated in general terms, both how they are characterized and how we must hunt for them, so as not to look to everything that is said about the terms of the problem or to the same points whether we are confirming or refuting, or again whether we are

confirming of all or of some, and whether we are refuting of all or some. we must look to fewer points and they must be definite. We have also stated how we must select with reference to everything that is, e.g. about good or knowledge. But in each science the principles which are peculiar are the most numerous. Consequently it is the business of experience to give the principles which belong to each subject. I mean for example that astronomical experience supplies the principles of astronomical science: for once the phenomena were adequately apprehended, the demonstrations of astronomy were discovered. Similarly with any other art or science. Consequently, if the attributes of the thing are apprehended, our business will then be to exhibit readily the demonstrations. For if none of the true attributes of things had been omitted in the historical survey, we should be able to discover the proof and demonstrate everything which admitted of proof, and to make that clear, whose nature does not admit of proof.

In general then we have explained fairly well how we must select premisses: we have discussed the matter accurately in the treatise concerning dialectic.

31

It is easy to see that division into classes is a small part of the method we have described: for division is, so to speak, a weak syllogism; for what it ought to prove, it begs, and it always establishes something more general than the attribute in question. First, this very point had escaped all those who used the method of division; and they attempted to persuade men that it was possible to make a demonstration of substance and essence. Consequently they did not understand what it is

possible to prove syllogistically by division, nor did they understand that it was possible to prove syllogistically in the manner we have described. In demonstrations, when there is a need to prove a positive statement, the middle term through which the syllogism is formed must always be inferior to and not comprehend the first of the extremes. But division has a contrary intention: for it takes the universal as middle. Let animal be the term signified by A, mortal by B, and immortal by C, and let man, whose definition is to be got, be signified by D. The man who divides assumes that every animal is either mortal or immortal: i.e. whatever is A is all either B or C. Again, always dividing, he lays it down that man is an animal, so he assumes A of D as belonging to it. Now the true conclusion is that every D is either B or C, consequently man must be either mortal or immortal, but it is not necessary that man should be a mortal animal – this is begged: and this is what ought to have been proved syllogistically. And again, taking A as mortal animal, B as footed, C as footless, and D as man, he assumes in the same way that A inheres either in B or in C (for every mortal animal is either footed or footless), and he assumes A of D (for he assumed man, as we saw, to be a mortal animal); consequently it is necessary that man should be either a footed or a footless animal; but it is not necessary that man should be footed: this he assumes: and it is just this again which he ought to have demonstrated. Always dividing then in this way it turns out that these logicians assume as middle the universal term, and as extremes that which ought to have been the subject of demonstration and the differentiae. In conclusion, they do not make it clear, and show it to be necessary, that this is man or whatever the subject of inquiry may be: for they pursue the other method altogether, never even suspecting the presence of the rich supply of evidence which might be used. It is clear that it is neither possible to refute a statement by this method of division, nor to draw a conclusion about an accident or property

of a thing, nor about its genus, nor in cases in which it is unknown whether it is thus or thus, e.g. whether the diagonal is incommensurate. For if he assumes that every length is either commensurate or incommensurate, and the diagonal is a length, he has proved that the diagonal is either incommensurate or commensurate. But if he should assume that it is incommensurate, he will have assumed what he ought to have proved. He cannot then prove it: for this is his method, but proof is not possible by this method. Let A stand for 'incommensurate or commensurate', B for 'length', C for 'diagonal'. It is clear then that this method of investigation is not suitable for every inquiry, nor is it useful in those cases in which it is thought to be most suitable.

From what has been said it is clear from what elements demonstrations are formed and in what manner, and to what points we must look in each problem.

32

Our next business is to state how we can reduce syllogisms to the aforementioned figures: for this part of the inquiry still remains. If we should investigate the production of the syllogisms and had the power of discovering them, and further if we could resolve the syllogisms produced into the aforementioned figures, our original problem would be brought to a conclusion. It will happen at the same time that what has been already said will be confirmed and its truth made clearer by what we are about to say. For everything that is true must in every respect agree with itself First then we must attempt to select the two premisses of the syllogism (for it is easier to divide into large parts than into small, and the composite parts

are larger than the elements out of which they are made); next we must inquire which are universal and which particular, and if both premisses have not been stated, we must ourselves assume the one which is missing. For sometimes men put forward the universal premiss, but do not posit the premiss which is contained in it, either in writing or in discussion: or men put forward the premisses of the principal syllogism, but omit those through which they are inferred, and invite the concession of others to no purpose. We must inquire then whether anything unnecessary has been assumed, or anything necessary has been omitted, and we must posit the one and take away the other, until we have reached the two premisses: for unless we have these, we cannot reduce arguments put forward in the way described. In some arguments it is easy to see what is wanting, but some escape us, and appear to be syllogisms, because something necessary results from what has been laid down, e.g. if the assumptions were made that substance is not annihilated by the annihilation of what is not substance, and that if the elements out of which a thing is made are annihilated, then that which is made out of them is destroyed: these propositions being laid down, it is necessary that any part of substance is substance; this has not however been drawn by syllogism from the propositions assumed, but premisses are wanting. Again if it is necessary that animal should exist, if man does, and that substance should exist, if animal does, it is necessary that substance should exist if man does: but as yet the conclusion has not been drawn syllogistically: for the premisses are not in the shape we required. We are deceived in such cases because something necessary results from what is assumed, since the syllogism also is necessary. But that which is necessary is wider than the syllogism: for every syllogism is necessary, but not everything which is necessary is a syllogism. Consequently, though something results when certain propositions are assumed, we

must not try to reduce it directly, but must first state the two premisses, then divide them into their terms. We must take that term as middle which is stated in both the remisses: for it is necessary that the middle should be found in both premisses in all the figures.

If then the middle term is a predicate and a subject of predication, or if it is a predicate, and something else is denied of it, we shall have the first figure: if it both is a predicate and is denied of something, the middle figure: if other things are predicated of it, or one is denied, the other predicated, the last figure. For it was thus that we found the middle term placed in each figure. It is placed similarly too if the premisses are not universal: for the middle term is determined in the same way. Clearly then, if the same term is not stated more than once in the course of an argument, a syllogism cannot be made: for a middle term has not been taken. Since we know what sort of thesis is established in each figure, and in which the universal, in what sort the particular is described, clearly we must not look for all the figures, but for that which is appropriate to the thesis in hand. If the thesis is established in more figures than one, we shall recognize the figure by the position of the middle term.

33

Men are frequently deceived about syllogisms because the inference is necessary, as has been said above; sometimes they are deceived by the similarity in the positing of the terms; and this ought not to escape our notice. E.g. if A is stated of B, and B of C: it would seem that a syllogism is possible since the terms stand thus: but nothing necessary results, nor does a syllogism.

Let A represent the term ‘being eternal’, B ‘Aristomenes as an object of thought’, C ‘Aristomenes’. It is true then that A belongs to B. For Aristomenes as an object of thought is eternal. But B also belongs to C: for Aristomenes is Aristomenes as an object of thought. But A does not belong to C: for Aristomenes is perishable. For no syllogism was made although the terms stood thus: that required that the premiss AB should be stated universally. But this is false, that every Aristomenes who is an object of thought is eternal, since Aristomenes is perishable. Again let C stand for ‘Miccalus’, B for ‘musical Miccalus’, A for ‘perishing to-morrow’. It is true to predicate B of C: for Miccalus is musical Miccalus. Also A can be predicated of B: for musical Miccalus might perish to-morrow. But to state A of C is false at any rate. This argument then is identical with the former; for it is not true universally that musical Miccalus perishes to-morrow: but unless this is assumed, no syllogism (as we have shown) is possible.

This deception then arises through ignoring a small distinction. For if we accept the conclusion as though it made no difference whether we said ‘This belong to that’ or ‘This belongs to all of that’.

34

Men will frequently fall into fallacies through not setting out the terms of the premiss well, e.g. suppose A to be health, B disease, C man. It is true to say that A cannot belong to any B (for health belongs to no disease) and again that B belongs to every C (for every man is capable of disease). It would seem to follow that health cannot belong to any man. The reason for this is that the terms are not set out well in the statement, since

if the things which are in the conditions are substituted, no syllogism can be made, e.g. if ‘healthy’ is substituted for ‘health’ and ‘diseased’ for ‘disease’. For it is not true to say that being healthy cannot belong to one who is diseased. But unless this is assumed no conclusion results, save in respect of possibility: but such a conclusion is not impossible: for it is possible that health should belong to no man. Again the fallacy may occur in a similar way in the middle figure: ‘it is not possible that health should belong to any disease, but it is possible that health should belong to every man, consequently it is not possible that disease should belong to any man’. In the third figure the fallacy results in reference to possibility. For health and diseae and knowledge and ignorance, and in general contraries, may possibly belong to the same thing, but cannot belong to one another. This is not in agreement with what was said before: for we stated that when several things could belong to the same thing, they could belong to one another.

It is evident then that in all these cases the fallacy arises from the setting out of the terms: for if the things that are in the conditions are substituted, no fallacy arises. It is clear then that in such premisses what possesses the condition ought always to be substituted for the condition and taken as the term.

35

We must not always seek to set out the terms a single word: for we shall often have complexes of words to which a single name is not given. Hence it is difficult to reduce syllogisms with such terms. Sometimes too fallacies will result from such a search, e.g. the belief that syllogism can establish that which has no mean. Let A stand for two right angles, B for triangle, C for

isosceles triangle. A then belongs to C because of B: but A belongs to B without the mediation of another term: for the triangle in virtue of its own nature contains two right angles, consequently there will be no middle term for the proposition AB, although it is demonstrable. For it is clear that the middle must not always be assumed to be an individual thing, but sometimes a complex of words, as happens in the case mentioned.

36

That the first term belongs to the middle, and the middle to the extreme, must not be understood in the sense that they can always be predicated of one another or that the first term will be predicated of the middle in the same way as the middle is predicated of the last term. The same holds if the premisses are negative. But we must suppose the verb 'to belong' to have as many meanings as the senses in which the verb 'to be' is used, and in which the assertion that a thing 'is' may be said to be true. Take for example the statement that there is a single science of contraries. Let A stand for 'there being a single science', and B for things which are contrary to one another. Then A belongs to B, not in the sense that contraries are the fact of there being a single science of them, but in the sense that it is true to say of the contraries that there is a single science of them.

It happens sometimes that the first term is stated of the middle, but the middle is not stated of the third term, e.g. if wisdom is knowledge, and wisdom is of the good, the conclusion is that there is knowledge of the good. The good then is not knowledge, though wisdom is knowledge. Sometimes the middle term is

stated of the third, but the first is not stated of the middle, e.g. if there is a science of everything that has a quality, or is a contrary, and the good both is a contrary and has a quality, the conclusion is that there is a science of the good, but the good is not science, nor is that which has a quality or is a contrary, though the good is both of these. Sometimes neither the first term is stated of the middle, nor the middle of the third, while the first is sometimes stated of the third, and sometimes not: e.g. if there is a genus of that of which there is a science, and if there is a science of the good, we conclude that there is a genus of the good. But nothing is predicated of anything. And if that of which there is a science is a genus, and if there is a science of the good, we conclude that the good is a genus. The first term then is predicated of the extreme, but in the premisses one thing is not stated of another.

The same holds good where the relation is negative. For 'that does not belong to this' does not always mean that 'this is not that', but sometimes that 'this is not of that' or 'for that', e.g. 'there is not a motion of a motion or a becoming of a becoming, but there is a becoming of pleasure: so pleasure is not a becoming.' Or again it may be said that there is a sign of laughter, but there is not a sign of a sign, consequently laughter is not a sign. This holds in the other cases too, in which the thesis is refuted because the genus is asserted in a particular way, in relation to the terms of the thesis. Again take the inference 'opportunity is not the right time: for opportunity belongs to God, but the right time does not, since nothing is useful to God'. We must take as terms opportunity-right time-God: but the premiss must be understood according to the case of the noun. For we state this universally without qualification, that the terms ought always to be stated in the nominative, e.g. man, good, contraries, not in oblique cases, e.g. of man, of a good, of contraries, but the premisses ought to be understood with reference to the cases of each term –either the dative, e.g.

‘equal to this’, or the genitive, e.g. ‘double of this’, or the accusative, e.g. ‘that which strikes or sees this’, or the nominative, e.g. ‘man is an animal’, or in whatever other way the word falls in the premiss.

37

The expressions ‘this belongs to that’ and ‘this holds true of that’ must be understood in as many ways as there are different categories, and these categories must be taken either with or without qualification, and further as simple or compound: the same holds good of the corresponding negative expressions. We must consider these points and define them better.

38

A term which is repeated in the premisses ought to be joined to the first extreme, not to the middle. I mean for example that if a syllogism should be made proving that there is knowledge of justice, that it is good, the expression ‘that it is good’ (or ‘qua good’) should be joined to the first term. Let A stand for ‘knowledge that it is good’, B for good, C for justice. It is true to predicate A of B. For of the good there is knowledge that it is good. Also it is true to predicate B of C. For justice is identical with a good. In this way an analysis of the argument can be made. But if the expression ‘that it is good’ were added to B, the conclusion will not follow: for A will be true of B, but B will not be true of C. For to predicate of justice the term ‘good that it is good’ is false and not intelligible. Similarly if it should be proved

that the healthy is an object of knowledge qua good, of goat-stag an object of knowledge qua not existing, or man perishable qua an object of sense: in every case in which an addition is made to the predicate, the addition must be joined to the extreme.

The position of the terms is not the same when something is established without qualification and when it is qualified by some attribute or condition, e.g. when the good is proved to be an object of knowledge and when it is proved to be an object of knowledge that it is good. If it has been proved to be an object of knowledge without qualification, we must put as middle term 'that which is', but if we add the qualification 'that it is good', the middle term must be 'that which is something'. Let A stand for 'knowledge that it is something', B stand for 'something', and C stand for 'good'. It is true to predicate A of B: for ex hypothesi there is a science of that which is something, that it is something. B too is true of C: for that which C represents is something. Consequently A is true of C: there will then be knowledge of the good, that it is good: for ex hypothesi the term 'something' indicates the thing's special nature. But if 'being' were taken as middle and 'being' simply were joined to the extreme, not 'being something', we should not have had a syllogism proving that there is knowledge of the good, that it is good, but that it is; e.g. let A stand for knowledge that it is, B for being, C for good. Clearly then in syllogisms which are thus limited we must take the terms in the way stated.

39

We ought also to exchange terms which have the same value, word for word, and phrase for phrase, and word and phrase, and

always take a word in preference to a phrase: for thus the setting out of the terms will be easier. For example if it makes no difference whether we say that the supposable is not the genus of the opinable or that the opinable is not identical with a particular kind of supposable (for what is meant is the same in both statements), it is better to take as the terms the supposable and the opinable in preference to the phrase suggested.

40

Since the expressions 'pleasure is good' and 'pleasure is the good' are not identical, we must not set out the terms in the same way; but if the syllogism is to prove that pleasure is the good, the term must be 'the good', but if the object is to prove that pleasure is good, the term will be 'good'. Similarly in all other cases.

41

It is not the same, either in fact or in speech, that A belongs to all of that to which B belongs, and that A belongs to all of that to all of which B belongs: for nothing prevents B from belonging to C, though not to all C: e.g. let B stand for beautiful, and C for white. If beauty belongs to something white, it is true to say that beauty belongs to that which is white; but not perhaps to everything that is white. If then A belongs to B, but not to everything of which B is predicated, then whether B belongs to all C or merely belongs to C, it is not necessary that A should

belong, I do not say to all C, but even to C at all. But if A belongs to everything of which B is truly stated, it will follow that A can be said of all of that of all of which B is said. If however A is said of that of all of which B may be said, nothing prevents B belonging to C, and yet A not belonging to all C or to any C at all. If then we take three terms it is clear that the expression 'A is said of all of which B is said' means this, 'A is said of all the things of which B is said'. And if B is said of all of a third term, so also is A: but if B is not said of all of the third term, there is no necessity that A should be said of all of it.

We must not suppose that something absurd results through setting out the terms: for we do not use the existence of this particular thing, but imitate the geometrician who says that 'this line a foot long' or 'this straight line' or 'this line without breadth' exists although it does not, but does not use the diagrams in the sense that he reasons from them. For in general, if two things are not related as whole to part and part to whole, the prover does not prove from them, and so no syllogism a is formed. We (I mean the learner) use the process of setting out terms like perception by sense, not as though it were impossible to demonstrate without these illustrative terms, as it is to demonstrate without the premisses of the syllogism.

42

We should not forget that in the same syllogism not all conclusions are reached through one figure, but one through one figure, another through another. Clearly then we must analyse arguments in accordance with this. Since not every problem is proved in every figure, but certain problems in each

figure, it is clear from the conclusion in what figure the premisses should be sought.

43

In reference to those arguments aiming at a definition which have been directed to prove some part of the definition, we must take as a term the point to which the argument has been directed, not the whole definition: for so we shall be less likely to be disturbed by the length of the term: e.g. if a man proves that water is a drinkable liquid, we must take as terms drinkable and water.

44

Further we must not try to reduce hypothetical syllogisms; for with the given premisses it is not possible to reduce them. For they have not been proved by syllogism, but assented to by agreement. For instance if a man should suppose that unless there is one faculty of contraries, there cannot be one science, and should then argue that not every faculty is of contraries, e.g. of what is healthy and what is sickly: for the same thing will then be at the same time healthy and sickly. He has shown that there is not one faculty of all contraries, but he has not proved that there is not a science. And yet one must agree. But the agreement does not come from a syllogism, but from an hypothesis. This argument cannot be reduced: but the proof that there is not a single faculty can. The latter argument perhaps was a syllogism: but the former was an hypothesis.

The same holds good of arguments which are brought to a conclusion per impossibile. These cannot be analysed either; but the reduction to what is impossible can be analysed since it is proved by syllogism, though the rest of the argument cannot, because the conclusion is reached from an hypothesis. But these differ from the previous arguments: for in the former a preliminary agreement must be reached if one is to accept the conclusion; e.g. an agreement that if there is proved to be one faculty of contraries, then contraries fall under the same science; whereas in the latter, even if no preliminary agreement has been made, men still accept the reasoning, because the falsity is patent, e.g. the falsity of what follows from the assumption that the diagonal is commensurate, viz. that then odd numbers are equal to evens.

Many other arguments are brought to a conclusion by the help of an hypothesis; these we ought to consider and mark out clearly. We shall describe in the sequel their differences, and the various ways in which hypothetical arguments are formed: but at present this much must be clear, that it is not possible to resolve such arguments into the figures. And we have explained the reason.

45

Whatever problems are proved in more than one figure, if they have been established in one figure by syllogism, can be reduced to another figure, e.g. a negative syllogism in the first figure can be reduced to the second, and a syllogism in the middle figure to the first, not all however but some only. The point will be clear in the sequel. If A belongs to no B, and B to all C, then A belongs to no C. Thus the first figure; but if the

negative statement is converted, we shall have the middle figure. For B belongs to no A, and to all C. Similarly if the syllogism is not universal but particular, e.g. if A belongs to no B, and B to some C. Convert the negative statement and you will have the middle figure.

The universal syllogisms in the second figure can be reduced to the first, but only one of the two particular syllogisms. Let A belong to no B and to all C. Convert the negative statement, and you will have the first figure. For B will belong to no A and A to all C. But if the affirmative statement concerns B, and the negative C, C must be made first term. For C belongs to no A, and A to all B: therefore C belongs to no B. B then belongs to no C: for the negative statement is convertible.

But if the syllogism is particular, whenever the negative statement concerns the major extreme, reduction to the first figure will be possible, e.g. if A belongs to no B and to some C: convert the negative statement and you will have the first figure. For B will belong to no A and A to some C. But when the affirmative statement concerns the major extreme, no resolution will be possible, e.g. if A belongs to all B, but not to all C: for the statement AB does not admit of conversion, nor would there be a syllogism if it did.

Again syllogisms in the third figure cannot all be resolved into the first, though all syllogisms in the first figure can be resolved into the third. Let A belong to all B and B to some C. Since the particular affirmative is convertible, C will belong to some B: but A belonged to all B: so that the third figure is formed. Similarly if the syllogism is negative: for the particular affirmative is convertible: therefore A will belong to no B, and to some C.

Of the syllogisms in the last figure one only cannot be resolved into the first, viz. when the negative statement is not universal: all the rest can be resolved. Let A and B be affirmed of all C:

then C can be converted partially with either A or B: C then belongs to some B. Consequently we shall get the first figure, if A belongs to all C, and C to some of the Bs. If A belongs to all C and B to some C, the argument is the same: for B is convertible in reference to C. But if B belongs to all C and A to some C, the first term must be B: for B belongs to all C, and C to some A, therefore B belongs to some A. But since the particular statement is convertible, A will belong to some B. If the syllogism is negative, when the terms are universal we must take them in a similar way. Let B belong to all C, and A to no C: then C will belong to some B, and A to no C; and so C will be middle term. Similarly if the negative statement is universal, the affirmative particular: for A will belong to no C, and C to some of the Bs. But if the negative statement is particular, no resolution will be possible, e.g. if B belongs to all C, and A not belong to some C: convert the statement BC and both premisses will be particular.

It is clear that in order to resolve the figures into one another the premiss which concerns the minor extreme must be converted in both the figures: for when this premiss is altered, the transition to the other figure is made.

One of the syllogisms in the middle figure can, the other cannot, be resolved into the third figure. Whenever the universal statement is negative, resolution is possible. For if A belongs to no B and to some C, both B and C alike are convertible in relation to A, so that B belongs to no A and C to some A. A therefore is middle term. But when A belongs to all B, and not to some C, resolution will not be possible: for neither of the premisses is universal after conversion.

Syllogisms in the third figure can be resolved into the middle figure, whenever the negative statement is universal, e.g. if A belongs to no C, and B to some or all C. For C then will belong to

no A and to some B. But if the negative statement is particular, no resolution will be possible: for the particular negative does not admit of conversion.

It is clear then that the same syllogisms cannot be resolved in these figures which could not be resolved into the first figure, and that when syllogisms are reduced to the first figure these alone are confirmed by reduction to what is impossible.

It is clear from what we have said how we ought to reduce syllogisms, and that the figures may be resolved into one another.

46

In establishing or refuting, it makes some difference whether we suppose the expressions 'not to be this' and 'to be not-this' are identical or different in meaning, e.g. 'not to be white' and 'to be not-white'. For they do not mean the same thing, nor is 'to be not-white' the negation of 'to be white', but 'not to be white'. The reason for this is as follows. The relation of 'he can walk' to 'he can not-walk' is similar to the relation of 'it is white' to 'it is not-white'; so is that of 'he knows what is good' to 'he knows what is not-good'. For there is no difference between the expressions 'he knows what is good' and 'he is knowing what is good', or 'he can walk' and 'he is able to walk': therefore there is no difference between their contraries 'he cannot walk'-'he is not able to walk'. If then 'he is not able to walk' means the same as 'he is able not to walk', capacity to walk and incapacity to walk will belong at the same time to the same person (for the same man can both walk and not-walk, and is possessed of knowledge of what is good and of what is not-good), but an affirmation and a denial which are opposed to

one another do not belong at the same time to the same thing. As then ‘not to know what is good’ is not the same as ‘to know what is not good’, so ‘to be not-good’ is not the same as ‘not to be good’. For when two pairs correspond, if the one pair are different from one another, the other pair also must be different. Nor is ‘to be not-equal’ the same as ‘not to be equal’: for there is something underlying the one, viz. that which is not-equal, and this is the unequal, but there is nothing underlying the other. Wherefore not everything is either equal or unequal, but everything is equal or is not equal. Further the expressions ‘it is a not-white log’ and ‘it is not a white log’ do not imply one another’s truth. For if ‘it is a not-white log’, it must be a log: but that which is not a white log need not be a log at all. Therefore it is clear that ‘it is not-good’ is not the denial of ‘it is good’. If then every single statement may truly be said to be either an affirmation or a negation, if it is not a negation clearly it must in a sense be an affirmation. But every affirmation has a corresponding negation. The negation then of ‘it is not-good’ is ‘it is not not-good’. The relation of these statements to one another is as follows. Let A stand for ‘to be good’, B for ‘not to be good’, let C stand for ‘to be not-good’ and be placed under B, and let D stand for not to be not-good’ and be placed under A. Then either A or B will belong to everything, but they will never belong to the same thing; and either C or D will belong to everything, but they will never belong to the same thing. And B must belong to everything to which C belongs. For if it is true to say ‘it is a not-white’, it is true also to say ‘it is not white’: for it is impossible that a thing should simultaneously be white and be not-white, or be a not-white log and be a white log; consequently if the affirmation does not belong, the denial must belong. But C does not always belong to B: for what is not a log at all, cannot be a not-white log either. On the other hand D belongs to everything to which A belongs. For either C or D belongs to everything to which A belongs. But since a thing

cannot be simultaneously not-white and white, D must belong to everything to which A belongs. For of that which is white it is true to say that it is not not-white. But A is not true of all D. For of that which is not a log at all it is not true to say A, viz. that it is a white log. Consequently D is true, but A is not true, i.e. that it is a white log. It is clear also that A and C cannot together belong to the same thing, and that B and D may possibly belong to the same thing.

Privative terms are similarly related positive ter terms respect of this arrangement. Let A stand for 'equal', B for 'not equal', C for 'unequal', D for 'not unequal'.

In many things also, to some of which something belongs which does not belong to others, the negation may be true in a similar way, viz. that all are not white or that each is not white, while that each is not-white or all are not-white is false. Similarly also 'every animal is not-white' is not the negation of 'every animal is white' (for both are false): the proper negation is 'every animal is not white'. Since it is clear that 'it is not-white' and 'it is not white' mean different things, and one is an affirmation, the other a denial, it is evident that the method of proving each cannot be the same, e.g. that whatever is an animal is not white or may not be white, and that it is true to call it not-white; for this means that it is not-white. But we may prove that it is true to call it white or not-white in the same way for both are proved constructively by means of the first figure. For the expression 'it is true' stands on a similar footing to 'it is'. For the negation of 'it is true to call it white' is not 'it is true to call it not-white' but 'it is not true to call it white'. If then it is to be true to say that whatever is a man is musical or is not-musical, we must assume that whatever is an animal either is musical or is not-musical; and the proof has been made. That whatever is a man is not musical is proved destructively in the three ways mentioned.

In general whenever A and B are such that they cannot belong at the same time to the same thing, and one of the two necessarily belongs to everything, and again C and D are related in the same way, and A follows C but the relation cannot be reversed, then D must follow B and the relation cannot be reversed. And A and D may belong to the same thing, but B and C cannot. First it is clear from the following consideration that D follows B. For since either C or D necessarily belongs to everything; and since C cannot belong to that to which B belongs, because it carries A along with it and A and B cannot belong to the same thing; it is clear that D must follow B. Again since C does not reciprocate with but A, but C or D belongs to everything, it is possible that A and D should belong to the same thing. But B and C cannot belong to the same thing, because A follows C; and so something impossible results. It is clear then that B does not reciprocate with D either, since it is possible that D and A should belong at the same time to the same thing.

It results sometimes even in such an arrangement of terms that one is deceived through not apprehending the opposites rightly, one of which must belong to everything, e.g. we may reason that 'if A and B cannot belong at the same time to the same thing, but it is necessary that one of them should belong to whatever the other does not belong to: and again C and D are related in the same way, and follows everything which C follows: it will result that B belongs necessarily to everything to which D belongs': but this is false. 'Assume that F stands for the negation of A and B, and again that H stands for the negation of C and D. It is necessary then that either A or F should belong to everything: for either the affirmation or the denial must belong. And again either C or H must belong to everything: for they are related as affirmation and denial. And ex hypothesi A belongs to everything ever thing to which C belongs. Therefore H belongs to everything to which F belongs. Again since either F or B belongs to everything, and similarly either H or D, and since H

follows F, B must follow D: for we know this. If then A follows C, B must follow D'. But this is false: for as we proved the sequence is reversed in terms so constituted. The fallacy arises because perhaps it is not necessary that A or F should belong to everything, or that F or B should belong to everything: for F is not the denial of A. For not good is the negation of good: and not-good is not identical with 'neither good nor not-good'. Similarly also with C and D. For two negations have been assumed in respect to one term.

Book II

1

We have already explained the number of the figures, the character and number of the premisses, when and how a syllogism is formed; further what we must look for when a refuting and establishing propositions, and how we should investigate a given problem in any branch of inquiry, also by what means we shall obtain principles appropriate to each subject. Since some syllogisms are universal, others particular, all the universal syllogisms give more than one result, and of particular syllogisms the affirmative yield more than one, the negative yield only the stated conclusion. For all propositions are convertible save only the particular negative: and the conclusion states one definite thing about another definite thing. Consequently all syllogisms save the particular negative

yield more than one conclusion, e.g. if A has been proved to to all or to some B, then B must belong to some A: and if A has been proved to belong to no B, then B belongs to no A. This is a different conclusion from the former. But if A does not belong to some B, it is not necessary that B should not belong to some A: for it may possibly belong to all A.

This then is the reason common to all syllogisms whether universal or particular. But it is possible to give another reason concerning those which are universal. For all the things that are subordinate to the middle term or to the conclusion may be proved by the same syllogism, if the former are placed in the middle, the latter in the conclusion; e.g. if the conclusion AB is proved through C, whatever is subordinate to B or C must accept the predicate A: for if D is included in B as in a whole, and B is included in A, then D will be included in A. Again if E is included in C as in a whole, and C is included in A, then E will be included in A. Similarly if the syllogism is negative. In the second figure it will be possible to infer only that which is subordinate to the conclusion, e.g. if A belongs to no B and to all C; we conclude that B belongs to no C. If then D is subordinate to C, clearly B does not belong to it. But that B does not belong to what is subordinate to A is not clear by means of the syllogism. And yet B does not belong to E, if E is subordinate to A. But while it has been proved through the syllogism that B belongs to no C, it has been assumed without proof that B does not belong to A, consequently it does not result through the syllogism that B does not belong to E.

But in particular syllogisms there will be no necessity of inferring what is subordinate to the conclusion (for a syllogism does not result when this premiss is particular), but whatever is subordinate to the middle term may be inferred, not however through the syllogism, e.g. if A belongs to all B and B to some C. Nothing can be inferred about that which is subordinate to C;

something can be inferred about that which is subordinate to B, but not through the preceding syllogism. Similarly in the other figures. That which is subordinate to the conclusion cannot be proved; the other subordinate can be proved, only not through the syllogism, just as in the universal syllogisms what is subordinate to the middle term is proved (as we saw) from a premiss which is not demonstrated: consequently either a conclusion is not possible in the case of universal syllogisms or else it is possible also in the case of particular syllogisms.

2

It is possible for the premisses of the syllogism to be true, or to be false, or to be the one true, the other false. The conclusion is either true or false necessarily. From true premisses it is not possible to draw a false conclusion, but a true conclusion may be drawn from false premisses, true however only in respect to the fact, not to the reason. The reason cannot be established from false premisses: why this is so will be explained in the sequel.

First then that it is not possible to draw a false conclusion from true premisses, is made clear by this consideration. If it is necessary that B should be when A is, it is necessary that A should not be when B is not. If then A is true, B must be true: otherwise it will turn out that the same thing both is and is not at the same time. But this is impossible. Let it not, because A is laid down as a single term, be supposed that it is possible, when a single fact is given, that something should necessarily result. For that is not possible. For what results necessarily is the conclusion, and the means by which this comes about are at the least three terms, and two relations of subject and predicate or

premisses. If then it is true that A belongs to all that to which B belongs, and that B belongs to all that to which C belongs, it is necessary that A should belong to all that to which C belongs, and this cannot be false: for then the same thing will belong and not belong at the same time. So A is posited as one thing, being two premisses taken together. The same holds good of negative syllogisms: it is not possible to prove a false conclusion from true premisses.

But from what is false a true conclusion may be drawn, whether both the premisses are false or only one, provided that this is not either of the premisses indifferently, if it is taken as wholly false: but if the premiss is not taken as wholly false, it does not matter which of the two is false. (1) Let A belong to the whole of C, but to none of the Bs, neither let B belong to C. This is possible, e.g. animal belongs to no stone, nor stone to any man. If then A is taken to belong to all B and B to all C, A will belong to all C; consequently though both the premisses are false the conclusion is true: for every man is an animal. Similarly with the negative. For it is possible that neither A nor B should belong to any C, although A belongs to all B, e.g. if the same terms are taken and man is put as middle: for neither animal nor man belongs to any stone, but animal belongs to every man. Consequently if one term is taken to belong to none of that to which it does belong, and the other term is taken to belong to all of that to which it does not belong, though both the premisses are false the conclusion will be true. (2) A similar proof may be given if each premiss is partially false.

(3) But if one only of the premisses is false, when the first premiss is wholly false, e.g. AB, the conclusion will not be true, but if the premiss BC is wholly false, a true conclusion will be possible. I mean by 'wholly false' the contrary of the truth, e.g. if what belongs to none is assumed to belong to all, or if what belongs to all is assumed to belong to none. Let A belong to no

B, and B to all C. If then the premiss BC which I take is true, and the premiss AB is wholly false, viz. that A belongs to all B, it is impossible that the conclusion should be true: for A belonged to none of the Cs, since A belonged to nothing to which B belonged, and B belonged to all C. Similarly there cannot be a true conclusion if A belongs to all B, and B to all C, but while the true premiss BC is assumed, the wholly false premiss AB is also assumed, viz. that A belongs to nothing to which B belongs: here the conclusion must be false. For A will belong to all C, since A belongs to everything to which B belongs, and B to all C. It is clear then that when the first premiss is wholly false, whether affirmative or negative, and the other premiss is true, the conclusion cannot be true.

(4) But if the premiss is not wholly false, a true conclusion is possible. For if A belongs to all C and to some B, and if B belongs to all C, e.g. animal to every swan and to some white thing, and white to every swan, then if we take as premisses that A belongs to all B, and B to all C, A will belong to all C truly: for every swan is an animal. Similarly if the statement AB is negative. For it is possible that A should belong to some B and to no C, and that B should belong to all C, e.g. animal to some white thing, but to no snow, and white to all snow. If then one should assume that A belongs to no B, and B to all C, then will belong to no C.

(5) But if the premiss AB, which is assumed, is wholly true, and the premiss BC is wholly false, a true syllogism will be possible: for nothing prevents A belonging to all B and to all C, though B belongs to no C, e.g. these being species of the same genus which are not subordinate one to the other: for animal belongs both to horse and to man, but horse to no man. If then it is assumed that A belongs to all B and B to all C, the conclusion will be true, although the premiss BC is wholly false. Similarly if the premiss AB is negative. For it is possible that A should

belong neither to any B nor to any C, and that B should not belong to any C, e.g. a genus to species of another genus: for animal belongs neither to music nor to the art of healing, nor does music belong to the art of healing. If then it is assumed that A belongs to no B, and B to all C, the conclusion will be true.

(6) And if the premiss BC is not wholly false but in part only, even so the conclusion may be true. For nothing prevents A belonging to the whole of B and of C, while B belongs to some C, e.g. a genus to its species and difference: for animal belongs to every man and to every footed thing, and man to some footed things though not to all. If then it is assumed that A belongs to all B, and B to all C, A will belong to all C: and this ex hypothesi is true. Similarly if the premiss AB is negative. For it is possible that A should neither belong to any B nor to any C, though B belongs to some C, e.g. a genus to the species of another genus and its difference: for animal neither belongs to any wisdom nor to any instance of 'speculative', but wisdom belongs to some instance of 'speculative'. If then it should be assumed that A belongs to no B, and B to all C, will belong to no C: and this ex hypothesi is true.

In particular syllogisms it is possible when the first premiss is wholly false, and the other true, that the conclusion should be true; also when the first premiss is false in part, and the other true; and when the first is true, and the particular is false; and when both are false. (7) For nothing prevents A belonging to no B, but to some C, and B to some C, e.g. animal belongs to no snow, but to some white thing, and snow to some white thing. If then snow is taken as middle, and animal as first term, and it is assumed that A belongs to the whole of B, and B to some C, then the premiss BC is wholly false, the premiss BC true, and the conclusion true. Similarly if the premiss AB is negative: for it is possible that A should belong to the whole of B, but not to some C, although B belongs to some C, e.g. animal belongs to every

man, but does not follow some white, but man belongs to some white; consequently if man be taken as middle term and it is assumed that A belongs to no B but B belongs to some C, the conclusion will be true although the premiss AB is wholly false. (If the premiss AB is false in part, the conclusion may be true. For nothing prevents A belonging both to B and to some C, and B belonging to some C, e.g. animal to something beautiful and to something great, and beautiful belonging to something great. If then A is assumed to belong to all B, and B to some C, the a premiss AB will be partially false, the premiss BC will be true, and the conclusion true. Similarly if the premiss AB is negative. For the same terms will serve, and in the same positions, to prove the point.

(9) Again if the premiss AB is true, and the premiss BC is false, the conclusion may be true. For nothing prevents A belonging to the whole of B and to some C, while B belongs to no C, e.g. animal to every swan and to some black things, though swan belongs to no black thing. Consequently if it should be assumed that A belongs to all B, and B to some C, the conclusion will be true, although the statement BC is false. Similarly if the premiss AB is negative. For it is possible that A should belong to no B, and not to some C, while B belongs to no C, e.g. a genus to the species of another genus and to the accident of its own species: for animal belongs to no number and not to some white things, and number belongs to nothing white. If then number is taken as middle, and it is assumed that A belongs to no B, and B to some C, then A will not belong to some C, which ex hypothesi is true. And the premiss AB is true, the premiss BC false.

(10) Also if the premiss AB is partially false, and the premiss BC is false too, the conclusion may be true. For nothing prevents A belonging to some B and to some C, though B belongs to no C, e.g. if B is the contrary of C, and both are accidents of the same genus: for animal belongs to some white things and to some

black things, but white belongs to no black thing. If then it is assumed that A belongs to all B, and B to some C, the conclusion will be true. Similarly if the premiss AB is negative: for the same terms arranged in the same way will serve for the proof.

(11) Also though both premisses are false the conclusion may be true. For it is possible that A may belong to no B and to some C, while B belongs to no C, e.g. a genus in relation to the species of another genus, and to the accident of its own species: for animal belongs to no number, but to some white things, and number to nothing white. If then it is assumed that A belongs to all B and B to some C, the conclusion will be true, though both premisses are false. Similarly also if the premiss AB is negative. For nothing prevents A belonging to the whole of B, and not to some C, while B belongs to no C, e.g. animal belongs to every swan, and not to some black things, and swan belongs to nothing black. Consequently if it is assumed that A belongs to no B, and B to some C, then A does not belong to some C. The conclusion then is true, but the premisses arc false.

3

In the middle figure it is possible in every way to reach a true conclusion through false premisses, whether the syllogisms are universal or particular, viz. when both premisses are wholly false; when each is partially false; when one is true, the other wholly false (it does not matter which of the two premisses is false); if both premisses are partially false; if one is quite true, the other partially false; if one is wholly false, the other partially true. For (1) if A belongs to no B and to all C, e.g. animal to no stone and to every horse, then if the premisses are stated contrariwise and it is assumed that A belongs to all B and to no

C, though the premisses are wholly false they will yield a true conclusion. Similarly if A belongs to all B and to no C: for we shall have the same syllogism.

(2) Again if one premiss is wholly false, the other wholly true: for nothing prevents A belonging to all B and to all C, though B belongs to no C, e.g. a genus to its co-ordinate species. For animal belongs to every horse and man, and no man is a horse. If then it is assumed that animal belongs to all of the one, and none of the other, the one premiss will be wholly false, the other wholly true, and the conclusion will be true whichever term the negative statement concerns.

(3) Also if one premiss is partially false, the other wholly true. For it is possible that A should belong to some B and to all C, though B belongs to no C, e.g. animal to some white things and to every raven, though white belongs to no raven. If then it is assumed that A belongs to no B, but to the whole of C, the premiss AB is partially false, the premiss AC wholly true, and the conclusion true. Similarly if the negative statement is transposed: the proof can be made by means of the same terms. Also if the affirmative premiss is partially false, the negative wholly true, a true conclusion is possible. For nothing prevents A belonging to some B, but not to C as a whole, while B belongs to no C, e.g. animal belongs to some white things, but to no pitch, and white belongs to no pitch. Consequently if it is assumed that A belongs to the whole of B, but to no C, the premiss AB is partially false, the premiss AC is wholly true, and the conclusion is true.

(4) And if both the premisses are partially false, the conclusion may be true. For it is possible that A should belong to some B and to some C, and B to no C, e.g. animal to some white things and to some black things, though white belongs to nothing black. If then it is assumed that A belongs to all B and to no C,

both premisses are partially false, but the conclusion is true. Similarly, if the negative premiss is transposed, the proof can be made by means of the same terms.

It is clear also that our thesis holds in particular syllogisms. For (5) nothing prevents A belonging to all B and to some C, though B does not belong to some C, e.g. animal to every man and to some white things, though man will not belong to some white things. If then it is stated that A belongs to no B and to some C, the universal premiss is wholly false, the particular premiss is true, and the conclusion is true. Similarly if the premiss AB is affirmative: for it is possible that A should belong to no B, and not to some C, though B does not belong to some C, e.g. animal belongs to nothing lifeless, and does not belong to some white things, and lifeless will not belong to some white things. If then it is stated that A belongs to all B and not to some C, the premiss AB which is universal is wholly false, the premiss AC is true, and the conclusion is true. Also a true conclusion is possible when the universal premiss is true, and the particular is false. For nothing prevents A following neither B nor C at all, while B does not belong to some C, e.g. animal belongs to no number nor to anything lifeless, and number does not follow some lifeless things. If then it is stated that A belongs to no B and to some C, the conclusion will be true, and the universal premiss true, but the particular false. Similarly if the premiss which is stated universally is affirmative. For it is possible that should A belong both to B and to C as wholes, though B does not follow some C, e.g. a genus in relation to its species and difference: for animal follows every man and footed things as a whole, but man does not follow every footed thing. Consequently if it is assumed that A belongs to the whole of B, but does not belong to some C, the universal premiss is true, the particular false, and the conclusion true.

(6) It is clear too that though both premisses are false they may yield a true conclusion, since it is possible that A should belong both to B and to C as wholes, though B does not follow some C. For if it is assumed that A belongs to no B and to some C, the premisses are both false, but the conclusion is true. Similarly if the universal premiss is affirmative and the particular negative. For it is possible that A should follow no B and all C, though B does not belong to some C, e.g. animal follows no science but every man, though science does not follow every man. If then A is assumed to belong to the whole of B, and not to follow some C, the premisses are false but the conclusion is true.

4

In the last figure a true conclusion may come through what is false, alike when both premisses are wholly false, when each is partly false, when one premiss is wholly true, the other false, when one premiss is partly false, the other wholly true, and vice versa, and in every other way in which it is possible to alter the premisses. For (1) nothing prevents neither A nor B from belonging to any C, while A belongs to some B, e.g. neither man nor footed follows anything lifeless, though man belongs to some footed things. If then it is assumed that A and B belong to all C, the premisses will be wholly false, but the conclusion true. Similarly if one premiss is negative, the other affirmative. For it is possible that B should belong to no C, but A to all C, and that should not belong to some B, e.g. black belongs to no swan, animal to every swan, and animal not to everything black. Consequently if it is assumed that B belongs to all C, and A to no C, A will not belong to some B: and the conclusion is true, though the premisses are false.

(2) Also if each premiss is partly false, the conclusion may be true. For nothing prevents both A and B from belonging to some C while A belongs to some B, e.g. white and beautiful belong to some animals, and white to some beautiful things. If then it is stated that A and B belong to all C, the premisses are partially false, but the conclusion is true. Similarly if the premiss AC is stated as negative. For nothing prevents A from not belonging, and B from belonging, to some C, while A does not belong to all B, e.g. white does not belong to some animals, beautiful belongs to some animals, and white does not belong to everything beautiful. Consequently if it is assumed that A belongs to no C, and B to all C, both premisses are partly false, but the conclusion is true.

(3) Similarly if one of the premisses assumed is wholly false, the other wholly true. For it is possible that both A and B should follow all C, though A does not belong to some B, e.g. animal and white follow every swan, though animal does not belong to everything white. Taking these then as terms, if one assumes that B belongs to the whole of C, but A does not belong to C at all, the premiss BC will be wholly true, the premiss AC wholly false, and the conclusion true. Similarly if the statement BC is false, the statement AC true, the conclusion may be true. The same terms will serve for the proof. Also if both the premisses assumed are affirmative, the conclusion may be true. For nothing prevents B from following all C, and A from not belonging to C at all, though A belongs to some B, e.g. animal belongs to every swan, black to no swan, and black to some animals. Consequently if it is assumed that A and B belong to every C, the premiss BC is wholly true, the premiss AC is wholly false, and the conclusion is true. Similarly if the premiss AC which is assumed is true: the proof can be made through the same terms.

(4) Again if one premiss is wholly true, the other partly false, the conclusion may be true. For it is possible that B should belong to all C, and A to some C, while A belongs to some B, e.g. biped belongs to every man, beautiful not to every man, and beautiful to some bipeds. If then it is assumed that both A and B belong to the whole of C, the premiss BC is wholly true, the premiss AC partly false, the conclusion true. Similarly if of the premisses assumed AC is true and BC partly false, a true conclusion is possible: this can be proved, if the same terms as before are transposed. Also the conclusion may be true if one premiss is negative, the other affirmative. For since it is possible that B should belong to the whole of C, and A to some C, and, when they are so, that A should not belong to all B, therefore it is assumed that B belongs to the whole of C, and A to no C, the negative premiss is partly false, the other premiss wholly true, and the conclusion is true. Again since it has been proved that if A belongs to no C and B to some C, it is possible that A should not belong to some C, it is clear that if the premiss AC is wholly true, and the premiss BC partly false, it is possible that the conclusion should be true. For if it is assumed that A belongs to no C, and B to all C, the premiss AC is wholly true, and the premiss BC is partly false.

(5) It is clear also in the case of particular syllogisms that a true conclusion may come through what is false, in every possible way. For the same terms must be taken as have been taken when the premisses are universal, positive terms in positive syllogisms, negative terms in negative. For it makes no difference to the setting out of the terms, whether one assumes that what belongs to none belongs to all or that what belongs to some belongs to all. The same applies to negative statements.

It is clear then that if the conclusion is false, the premisses of the argument must be false, either all or some of them; but when the conclusion is true, it is not necessary that the

premisses should be true, either one or all, yet it is possible, though no part of the syllogism is true, that the conclusion may none the less be true; but it is not necessitated. The reason is that when two things are so related to one another, that if the one is, the other necessarily is, then if the latter is not, the former will not be either, but if the latter is, it is not necessary that the former should be. But it is impossible that the same thing should be necessitated by the being and by the not-being of the same thing. I mean, for example, that it is impossible that B should necessarily be great since A is white and that B should necessarily be great since A is not white. For whenever since this, A, is white it is necessary that that, B, should be great, and since B is great that C should not be white, then it is necessary if is white that C should not be white. And whenever it is necessary, since one of two things is, that the other should be, it is necessary, if the latter is not, that the former (viz. A) should not be. If then B is not great A cannot be white. But if, when A is not white, it is necessary that B should be great, it necessarily results that if B is not great, B itself is great. (But this is impossible.) For if B is not great, A will necessarily not be white. If then when this is not white B must be great, it results that if B is not great, it is great, just as if it were proved through three terms.

5

Circular and reciprocal proof means proof by means of the conclusion, i.e. by converting one of the premisses simply and inferring the premiss which was assumed in the original syllogism: e.g. suppose it has been necessary to prove that A belongs to all C, and it has been proved through B; suppose that A should now be proved to belong to B by assuming that A

belongs to C, and C to B – so A belongs to B: but in the first syllogism the converse was assumed, viz. that B belongs to C. Or suppose it is necessary to prove that B belongs to C, and A is assumed to belong to C, which was the conclusion of the first syllogism, and B to belong to A but the converse was assumed in the earlier syllogism, viz. that A belongs to B. In no other way is reciprocal proof possible. If another term is taken as middle, the proof is not circular: for neither of the propositions assumed is the same as before: if one of the accepted terms is taken as middle, only one of the premisses of the first syllogism can be assumed in the second: for if both of them are taken the same conclusion as before will result: but it must be different. If the terms are not convertible, one of the premisses from which the syllogism results must be undemonstrated: for it is not possible to demonstrate through these terms that the third belongs to the middle or the middle to the first. If the terms are convertible, it is possible to demonstrate everything reciprocally, e.g. if A and B and C are convertible with one another. Suppose the proposition AC has been demonstrated through B as middle term, and again the proposition AB through the conclusion and the premiss BC converted, and similarly the proposition BC through the conclusion and the premiss AB converted. But it is necessary to prove both the premiss CB, and the premiss BA: for we have used these alone without demonstrating them. If then it is assumed that B belongs to all C, and C to all A, we shall have a syllogism relating B to A. Again if it is assumed that C belongs to all A, and A to all B, C must belong to all B. In both these syllogisms the premiss CA has been assumed without being demonstrated: the other premisses had ex hypothesi been proved. Consequently if we succeed in demonstrating this premiss, all the premisses will have been proved reciprocally. If then it is assumed that C belongs to all B, and B to all A, both the premisses assumed have been proved, and C must belong to A. It is clear then that only if the terms are convertible is

circular and reciprocal demonstration possible (if the terms are not convertible, the matter stands as we said above). But it turns out in these also that we use for the demonstration the very thing that is being proved: for C is proved of B, and B of by assuming that C is said of and C is proved of A through these premisses, so that we use the conclusion for the demonstration.

In negative syllogisms reciprocal proof is as follows. Let B belong to all C, and A to none of the Bs: we conclude that A belongs to none of the Cs. If again it is necessary to prove that A belongs to none of the Bs (which was previously assumed) A must belong to no C, and C to all B: thus the previous premiss is reversed. If it is necessary to prove that B belongs to C, the proposition AB must no longer be converted as before: for the premiss 'B belongs to no A' is identical with the premiss 'A belongs to no B'. But we must assume that B belongs to all of that to none of which longs. Let A belong to none of the Cs (which was the previous conclusion) and assume that B belongs to all of that to none of which A belongs. It is necessary then that B should belong to all C. Consequently each of the three propositions has been made a conclusion, and this is circular demonstration, to assume the conclusion and the converse of one of the premisses, and deduce the remaining premiss.

In particular syllogisms it is not possible to demonstrate the universal premiss through the other propositions, but the particular premiss can be demonstrated. Clearly it is impossible to demonstrate the universal premiss: for what is universal is proved through propositions which are universal, but the conclusion is not universal, and the proof must start from the conclusion and the other premiss. Further a syllogism cannot be made at all if the other premiss is converted: for the result is that both premisses are particular. But the particular premiss may be proved. Suppose that A has been proved of some C through B. If then it is assumed that B belongs to all A and the

conclusion is retained, B will belong to some C: for we obtain the first figure and A is middle. But if the syllogism is negative, it is not possible to prove the universal premiss, for the reason given above. But it is possible to prove the particular premiss, if the proposition AB is converted as in the universal syllogism, i.e 'B belongs to some of that to some of which A does not belong': otherwise no syllogism results because the particular premiss is negative.

6

In the second figure it is not possible to prove an affirmative proposition in this way, but a negative proposition may be proved. An affirmative proposition is not proved because both premisses of the new syllogism are not affirmative (for the conclusion is negative) but an affirmative proposition is (as we saw) proved from premisses which are both affirmative. The negative is proved as follows. Let A belong to all B, and to no C: we conclude that B belongs to no C. If then it is assumed that B belongs to all A, it is necessary that A should belong to no C: for we get the second figure, with B as middle. But if the premiss AB was negative, and the other affirmative, we shall have the first figure. For C belongs to all A and B to no C, consequently B belongs to no A: neither then does A belong to B. Through the conclusion, therefore, and one premiss, we get no syllogism, but if another premiss is assumed in addition, a syllogism will be possible. But if the syllogism not universal, the universal premiss cannot be proved, for the same reason as we gave above, but the particular premiss can be proved whenever the universal statement is affirmative. Let A belong to all B, and not to all C: the conclusion is BC. If then it is assumed that B belongs to all A, but not to all C, A will not belong to some C, B

being middle. But if the universal premiss is negative, the premiss AC will not be demonstrated by the conversion of AB: for it turns out that either both or one of the premisses is negative; consequently a syllogism will not be possible. But the proof will proceed as in the universal syllogisms, if it is assumed that A belongs to some of that to some of which B does not belong.

7

In the third figure, when both premisses are taken universally, it is not possible to prove them reciprocally: for that which is universal is proved through statements which are universal, but the conclusion in this figure is always particular, so that it is clear that it is not possible at all to prove through this figure the universal premiss. But if one premiss is universal, the other particular, proof of the latter will sometimes be possible, sometimes not. When both the premisses assumed are affirmative, and the universal concerns the minor extreme, proof will be possible, but when it concerns the other extreme, impossible. Let A belong to all C and B to some C: the conclusion is the statement AB. If then it is assumed that C belongs to all A, it has been proved that C belongs to some B, but that B belongs to some C has not been proved. And yet it is necessary, if C belongs to some B, that B should belong to some C. But it is not the same that this should belong to that, and that to this: but we must assume besides that if this belongs to some of that, that belongs to some of this. But if this is assumed the syllogism no longer results from the conclusion and the other premiss. But if B belongs to all C, and A to some C, it will be possible to prove the proposition AC, when it is assumed that C belongs to all B, and A to some B. For if C belongs to all B and A

to some B, it is necessary that A should belong to some C, B being middle. And whenever one premiss is affirmative the other negative, and the affirmative is universal, the other premiss can be proved. Let B belong to all C, and A not to some C: the conclusion is that A does not belong to some B. If then it is assumed further that C belongs to all B, it is necessary that A should not belong to some C, B being middle. But when the negative premiss is universal, the other premiss is not except as before, viz. if it is assumed that that belongs to some of that, to some of which this does not belong, e.g. if A belongs to no C, and B to some C: the conclusion is that A does not belong to some B. If then it is assumed that C belongs to some of that to some of which does not belong, it is necessary that C should belong to some of the Bs. In no other way is it possible by converting the universal premiss to prove the other: for in no other way can a syllogism be formed.

It is clear then that in the first figure reciprocal proof is made both through the third and through the first figure – if the conclusion is affirmative through the first; if the conclusion is negative through the last. For it is assumed that that belongs to all of that to none of which this belongs. In the middle figure, when the syllogism is universal, proof is possible through the second figure and through the first, but when particular through the second and the last. In the third figure all proofs are made through itself. It is clear also that in the third figure and in the middle figure those syllogisms which are not made through those figures themselves either are not of the nature of circular proof or are imperfect.

8

To convert a syllogism means to alter the conclusion and make another syllogism to prove that either the extreme cannot belong to the middle or the middle to the last term. For it is necessary, if the conclusion has been changed into its opposite and one of the premisses stands, that the other premiss should be destroyed. For if it should stand, the conclusion also must stand. It makes a difference whether the conclusion is converted into its contradictory or into its contrary. For the same syllogism does not result whichever form the conversion takes. This will be made clear by the sequel. By contradictory opposition I mean the opposition of 'to all' to 'not to all', and of 'to some' to 'to none'; by contrary opposition I mean the opposition of 'to all' to 'to none', and of 'to some' to 'not to some'. Suppose that A been proved of C, through B as middle term. If then it should be assumed that A belongs to no C, but to all B, B will belong to no C. And if A belongs to no C, and B to all C, A will belong, not to no B at all, but not to all B. For (as we saw) the universal is not proved through the last figure. In a word it is not possible to refute universally by conversion the premiss which concerns the major extreme: for the refutation always proceeds through the third since it is necessary to take both premisses in reference to the minor extreme. Similarly if the syllogism is negative. Suppose it has been proved that A belongs to no C through B. Then if it is assumed that A belongs to all C, and to no B, B will belong to none of the Cs. And if A and B belong to all C, A will belong to some B: but in the original premiss it belonged to no B.

If the conclusion is converted into its contradictory, the syllogisms will be contradictory and not universal. For one premiss is particular, so that the conclusion also will be particular. Let the syllogism be affirmative, and let it be converted as stated. Then if A belongs not to all C, but to all B, B

will belong not to all C. And if A belongs not to all C, but B belongs to all C, A will belong not to all B. Similarly if the syllogism is negative. For if A belongs to some C, and to no B, B will belong, not to no C at all, but – not to some C. And if A belongs to some C, and B to all C, as was originally assumed, A will belong to some B.

In particular syllogisms when the conclusion is converted into its contradictory, both premisses may be refuted, but when it is converted into its contrary, neither. For the result is no longer, as in the universal syllogisms, refutation in which the conclusion reached by O, conversion lacks universality, but no refutation at all. Suppose that A has been proved of some C. If then it is assumed that A belongs to no C, and B to some C, A will not belong to some B: and if A belongs to no C, but to all B, B will belong to no C. Thus both premisses are refuted. But neither can be refuted if the conclusion is converted into its contrary. For if A does not belong to some C, but to all B, then B will not belong to some C. But the original premiss is not yet refuted: for it is possible that B should belong to some C, and should not belong to some C. The universal premiss AB cannot be affected by a syllogism at all: for if A does not belong to some of the Cs, but B belongs to some of the Cs, neither of the premisses is universal. Similarly if the syllogism is negative: for if it should be assumed that A belongs to all C, both premisses are refuted: but if the assumption is that A belongs to some C, neither premiss is refuted. The proof is the same as before.

9

In the second figure it is not possible to refute the premiss which concerns the major extreme by establishing something

contrary to it, whichever form the conversion of the conclusion may take. For the conclusion of the refutation will always be in the third figure, and in this figure (as we saw) there is no universal syllogism. The other premiss can be refuted in a manner similar to the conversion: I mean, if the conclusion of the first syllogism is converted into its contrary, the conclusion of the refutation will be the contrary of the minor premiss of the first, if into its contradictory, the contradictory. Let A belong to all B and to no C: conclusion BC. If then it is assumed that B belongs to all C, and the proposition AB stands, A will belong to all C, since the first figure is produced. If B belongs to all C, and A to no C, then A belongs not to all B: the figure is the last. But if the conclusion BC is converted into its contradictory, the premiss AB will be refuted as before, the premiss, AC by its contradictory. For if B belongs to some C, and A to no C, then A will not belong to some B. Again if B belongs to some C, and A to all B, A will belong to some C, so that the syllogism results in the contradictory of the minor premiss. A similar proof can be given if the premisses are transposed in respect of their quality.

If the syllogism is particular, when the conclusion is converted into its contrary neither premiss can be refuted, as also happened in the first figure,' if the conclusion is converted into its contradictory, both premisses can be refuted. Suppose that A belongs to no B, and to some C: the conclusion is BC. If then it is assumed that B belongs to some C, and the statement AB stands, the conclusion will be that A does not belong to some C. But the original statement has not been refuted: for it is possible that A should belong to some C and also not to some C. Again if B belongs to some C and A to some C, no syllogism will be possible: for neither of the premisses taken is universal. Consequently the proposition AB is not refuted. But if the conclusion is converted into its contradictory, both premisses can be refuted. For if B belongs to all C, and A to no B, A will belong to no C: but it was assumed to belong to some C. Again if

B belongs to all C and A to some C, A will belong to some B. The same proof can be given if the universal statement is affirmative.

10

In the third figure when the conclusion is converted into its contrary, neither of the premisses can be refuted in any of the syllogisms, but when the conclusion is converted into its contradictory, both premisses may be refuted and in all the moods. Suppose it has been proved that A belongs to some B, C being taken as middle, and the premisses being universal. If then it is assumed that A does not belong to some B, but B belongs to all C, no syllogism is formed about A and C. Nor if A does not belong to some B, but belongs to all C, will a syllogism be possible about B and C. A similar proof can be given if the premisses are not universal. For either both premisses arrived at by the conversion must be particular, or the universal premiss must refer to the minor extreme. But we found that no syllogism is possible thus either in the first or in the middle figure. But if the conclusion is converted into its contradictory, both the premisses can be refuted. For if A belongs to no B, and B to all C, then A belongs to no C: again if A belongs to no B, and to all C, B belongs to no C. And similarly if one of the premisses is not universal. For if A belongs to no B, and B to some C, A will not belong to some C: if A belongs to no B, and to C, B will belong to no C.

Similarly if the original syllogism is negative. Suppose it has been proved that A does not belong to some B, BC being affirmative, AC being negative: for it was thus that, as we saw, a syllogism could be made. Whenever then the contrary of the

conclusion is assumed a syllogism will not be possible. For if A belongs to some B, and B to all C, no syllogism is possible (as we saw) about A and C. Nor, if A belongs to some B, and to no C, was a syllogism possible concerning B and C. Therefore the premisses are not refuted. But when the contradictory of the conclusion is assumed, they are refuted. For if A belongs to all B, and B to C, A belongs to all C: but A was supposed originally to belong to no C. Again if A belongs to all B, and to no C, then B belongs to no C: but it was supposed to belong to all C. A similar proof is possible if the premisses are not universal. For AC becomes universal and negative, the other premiss particular and affirmative. If then A belongs to all B, and B to some C, it results that A belongs to some C: but it was supposed to belong to no C. Again if A belongs to all B, and to no C, then B belongs to no C: but it was assumed to belong to some C. If A belongs to some B and B to some C, no syllogism results: nor yet if A belongs to some B, and to no C. Thus in one way the premisses are refuted, in the other way they are not.

From what has been said it is clear how a syllogism results in each figure when the conclusion is converted; when a result contrary to the premiss, and when a result contradictory to the premiss, is obtained. It is clear that in the first figure the syllogisms are formed through the middle and the last figures, and the premiss which concerns the minor extreme is alway refuted through the middle figure, the premiss which concerns the major through the last figure. In the second figure syllogisms proceed through the first and the last figures, and the premiss which concerns the minor extreme is always refuted through the first figure, the premiss which concerns the major extreme through the last. In the third figure the refutation proceeds through the first and the middle figures; the premiss which concerns the major is always refuted through the first figure, the premiss which concerns the minor through the middle figure.

11

It is clear then what conversion is, how it is effected in each figure, and what syllogism results. The syllogism per impossibile is proved when the contradictory of the conclusion stated and another premiss is assumed; it can be made in all the figures. For it resembles conversion, differing only in this: conversion takes place after a syllogism has been formed and both the premisses have been taken, but a reduction to the impossible takes place not because the contradictory has been agreed to already, but because it is clear that it is true. The terms are alike in both, and the premisses of both are taken in the same way. For example if A belongs to all B, C being middle, then if it is supposed that A does not belong to all B or belongs to no B, but to all C (which was admitted to be true), it follows that C belongs to no B or not to all B. But this is impossible: consequently the supposition is false: its contradictory then is true. Similarly in the other figures: for whatever moods admit of conversion admit also of the reduction per impossibile.

All the problems can be proved per impossibile in all the figures, excepting the universal affirmative, which is proved in the middle and third figures, but not in the first. Suppose that A belongs not to all B, or to no B, and take besides another premiss concerning either of the terms, viz. that C belongs to all A, or that B belongs to all D; thus we get the first figure. If then it is supposed that A does not belong to all B, no syllogism results whichever term the assumed premiss concerns; but if it is supposed that A belongs to no B, when the premiss BD is assumed as well we shall prove syllogistically what is false, but not the problem proposed. For if A belongs to no B, and B belongs to all D, A belongs to no D. Let this be impossible: it is

false then A belongs to no B. But the universal affirmative is not necessarily true if the universal negative is false. But if the premiss CA is assumed as well, no syllogism results, nor does it do so when it is supposed that A does not belong to all B. Consequently it is clear that the universal affirmative cannot be proved in the first figure per impossibile.

But the particular affirmative and the universal and particular negatives can all be proved. Suppose that A belongs to no B, and let it have been assumed that B belongs to all or to some C. Then it is necessary that A should belong to no C or not to all C. But this is impossible (for let it be true and clear that A belongs to all C): consequently if this is false, it is necessary that A should belong to some B. But if the other premiss assumed relates to A, no syllogism will be possible. Nor can a conclusion be drawn when the contrary of the conclusion is supposed, e.g. that A does not belong to some B. Clearly then we must suppose the contradictory.

Again suppose that A belongs to some B, and let it have been assumed that C belongs to all A. It is necessary then that C should belong to some B. But let this be impossible, so that the supposition is false: in that case it is true that A belongs to no B. We may proceed in the same way if the proposition CA has been taken as negative. But if the premiss assumed concerns B, no syllogism will be possible. If the contrary is supposed, we shall have a syllogism and an impossible conclusion, but the problem in hand is not proved. Suppose that A belongs to all B, and let it have been assumed that C belongs to all A. It is necessary then that C should belong to all B. But this is impossible, so that it is false that A belongs to all B. But we have not yet shown it to be necessary that A belongs to no B, if it does not belong to all B. Similarly if the other premiss taken concerns B; we shall have a syllogism and a conclusion which is impossible, but the

hypothesis is not refuted. Therefore it is the contradictory that we must suppose.

To prove that A does not belong to all B, we must suppose that it belongs to all B: for if A belongs to all B, and C to all A, then C belongs to all B; so that if this is impossible, the hypothesis is false. Similarly if the other premiss assumed concerns B. The same results if the original proposition CA was negative: for thus also we get a syllogism. But if the negative proposition concerns B, nothing is proved. If the hypothesis is that A belongs not to all but to some B, it is not proved that A belongs not to all B, but that it belongs to no B. For if A belongs to some B, and C to all A, then C will belong to some B. If then this is impossible, it is false that A belongs to some B; consequently it is true that A belongs to no B. But if this is proved, the truth is refuted as well; for the original conclusion was that A belongs to some B, and does not belong to some B. Further the impossible does not result from the hypothesis: for then the hypothesis would be false, since it is impossible to draw a false conclusion from true premisses: but in fact it is true: for A belongs to some B. Consequently we must not suppose that A belongs to some B, but that it belongs to all B. Similarly if we should be proving that A does not belong to some B: for if 'not to belong to some' and 'to belong not to all' have the same meaning, the demonstration of both will be identical.

It is clear then that not the contrary but the contradictory ought to be supposed in all the syllogisms. For thus we shall have necessity of inference, and the claim we make is one that will be generally accepted. For if of everything one or other of two contradictory statements holds good, then if it is proved that the negation does not hold, the affirmation must be true. Again if it is not admitted that the affirmation is true, the claim that the negation is true will be generally accepted. But in neither way does it suit to maintain the contrary: for it is not necessary

that if the universal negative is false, the universal affirmative should be true, nor is it generally accepted that if the one is false the other is true.

12

It is clear then that in the first figure all problems except the universal affirmative are proved per impossibile. But in the middle and the last figures this also is proved. Suppose that A does not belong to all B, and let it have been assumed that A belongs to all C. If then A belongs not to all B, but to all C, C will not belong to all B. But this is impossible (for suppose it to be clear that C belongs to all B): consequently the hypothesis is false. It is true then that A belongs to all B. But if the contrary is supposed, we shall have a syllogism and a result which is impossible: but the problem in hand is not proved. For if A belongs to no B, and to all C, C will belong to no B. This is impossible; so that it is false that A belongs to no B. But though this is false, it does not follow that it is true that A belongs to all B.

When A belongs to some B, suppose that A belongs to no B, and let A belong to all C. It is necessary then that C should belong to no B. Consequently, if this is impossible, A must belong to some B. But if it is supposed that A does not belong to some B, we shall have the same results as in the first figure.

Again suppose that A belongs to some B, and let A belong to no C. It is necessary then that C should not belong to some B. But originally it belonged to all B, consequently the hypothesis is false: A then will belong to no B.

When A does not belong to an B, suppose it does belong to all B, and to no C. It is necessary then that C should belong to no B. But this is impossible: so that it is true that A does not belong to all B. It is clear then that all the syllogisms can be formed in the middle figure.

13

Similarly they can all be formed in the last figure. Suppose that A does not belong to some B, but C belongs to all B: then A does not belong to some C. If then this is impossible, it is false that A does not belong to some B; so that it is true that A belongs to all B. But if it is supposed that A belongs to no B, we shall have a syllogism and a conclusion which is impossible: but the problem in hand is not proved: for if the contrary is supposed, we shall have the same results as before.

But to prove that A belongs to some B, this hypothesis must be made. If A belongs to no B, and C to some B, A will belong not to all C. If then this is false, it is true that A belongs to some B.

When A belongs to no B, suppose A belongs to some B, and let it have been assumed that C belongs to all B. Then it is necessary that A should belong to some C. But ex hypothesi it belongs to no C, so that it is false that A belongs to some B. But if it is supposed that A belongs to all B, the problem is not proved.

But this hypothesis must be made if we are prove that A belongs not to all B. For if A belongs to all B and C to some B, then A belongs to some C. But this we assumed not to be so, so it is false that A belongs to all B. But in that case it is true that A belongs not to all B. If however it is assumed that A belongs to some B, we shall have the same result as before.

It is clear then that in all the syllogisms which proceed per impossibile the contradictory must be assumed. And it is plain that in the middle figure an affirmative conclusion, and in the last figure a universal conclusion, are proved in a way.

14

Demonstration per impossibile differs from ostensive proof in that it posits what it wishes to refute by reduction to a statement admitted to be false; whereas ostensive proof starts from admitted positions. Both, indeed, take two premisses that are admitted, but the latter takes the premisses from which the syllogism starts, the former takes one of these, along with the contradictory of the original conclusion. Also in the ostensive proof it is not necessary that the conclusion should be known, nor that one should suppose beforehand that it is true or not: in the other it is necessary to suppose beforehand that it is not true. It makes no difference whether the conclusion is affirmative or negative; the method is the same in both cases. Everything which is concluded ostensively can be proved per impossibile, and that which is proved per impossibile can be proved ostensively, through the same terms. Whenever the syllogism is formed in the first figure, the truth will be found in the middle or the last figure, if negative in the middle, if affirmative in the last. Whenever the syllogism is formed in the middle figure, the truth will be found in the first, whatever the problem may be. Whenever the syllogism is formed in the last figure, the truth will be found in the first and middle figures, if affirmative in first, if negative in the middle. Suppose that A has been proved to belong to no B, or not to all B, through the first figure. Then the hypothesis must have been that A belongs to some B, and the original premisses that C belongs to all A and to

no B. For thus the syllogism was made and the impossible conclusion reached. But this is the middle figure, if C belongs to all A and to no B. And it is clear from these premisses that A belongs to no B. Similarly if has been proved not to belong to all B. For the hypothesis is that A belongs to all B; and the original premisses are that C belongs to all A but not to all B. Similarly too, if the premiss CA should be negative: for thus also we have the middle figure. Again suppose it has been proved that A belongs to some B. The hypothesis here is that is that A belongs to no B; and the original premisses that B belongs to all C, and A either to all or to some C: for in this way we shall get what is impossible. But if A and B belong to all C, we have the last figure. And it is clear from these premisses that A must belong to some B. Similarly if B or A should be assumed to belong to some C.

Again suppose it has been proved in the middle figure that A belongs to all B. Then the hypothesis must have been that A belongs not to all B, and the original premisses that A belongs to all C, and C to all B: for thus we shall get what is impossible. But if A belongs to all C, and C to all B, we have the first figure. Similarly if it has been proved that A belongs to some B: for the hypothesis then must have been that A belongs to no B, and the original premisses that A belongs to all C, and C to some B. If the syllogism is negative, the hypothesis must have been that A belongs to some B, and the original premisses that A belongs to no C, and C to all B, so that the first figure results. If the syllogism is not universal, but proof has been given that A does not belong to some B, we may infer in the same way. The hypothesis is that A belongs to all B, the original premisses that A belongs to no C, and C belongs to some B: for thus we get the first figure.

Again suppose it has been proved in the third figure that A belongs to all B. Then the hypothesis must have been that A

belongs not to all B, and the original premisses that C belongs to all B, and A belongs to all C; for thus we shall get what is impossible. And the original premisses form the first figure. Similarly if the demonstration establishes a particular proposition: the hypothesis then must have been that A belongs to no B, and the original premisses that C belongs to some B, and A to all C. If the syllogism is negative, the hypothesis must have been that A belongs to some B, and the original premisses that C belongs to no A and to all B, and this is the middle figure. Similarly if the demonstration is not universal. The hypothesis will then be that A belongs to all B, the premisses that C belongs to no A and to some B: and this is the middle figure.

It is clear then that it is possible through the same terms to prove each of the problems ostensively as well. Similarly it will be possible if the syllogisms are ostensive to reduce them ad impossibile in the terms which have been taken, whenever the contradictory of the conclusion of the ostensive syllogism is taken as a premiss. For the syllogisms become identical with those which are obtained by means of conversion, so that we obtain immediately the figures through which each problem will be solved. It is clear then that every thesis can be proved in both ways, i.e. per impossibile and ostensively, and it is not possible to separate one method from the other.

15

In what figure it is possible to draw a conclusion from premisses which are opposed, and in what figure this is not possible, will be made clear in this way. Verbally four kinds of opposition are possible, viz. universal affirmative to universal negative, universal affirmative to particular negative, particular

affirmative to universal negative, and particular affirmative to particular negative: but really there are only three: for the particular affirmative is only verbally opposed to the particular negative. Of the genuine opposites I call those which are universal contraries, the universal affirmative and the universal negative, e.g. 'every science is good', 'no science is good'; the others I call contradictories.

In the first figure no syllogism whether affirmative or negative can be made out of opposed premisses: no affirmative syllogism is possible because both premisses must be affirmative, but opposites are, the one affirmative, the other negative: no negative syllogism is possible because opposites affirm and deny the same predicate of the same subject, and the middle term in the first figure is not predicated of both extremes, but one thing is denied of it, and it is affirmed of something else: but such premisses are not opposed.

In the middle figure a syllogism can be made both oLcontradictories and of contraries. Let A stand for good, let B and C stand for science. If then one assumes that every science is good, and no science is good, A belongs to all B and to no C, so that B belongs to no C: no science then is a science. Similarly if after taking 'every science is good' one took 'the science of medicine is not good'; for A belongs to all B but to no C, so that a particular science will not be a science. Again, a particular science will not be a science if A belongs to all C but to no B, and B is science, C medicine, and A supposition: for after taking 'no science is supposition', one has assumed that a particular science is supposition. This syllogism differs from the preceding because the relations between the terms are reversed: before, the affirmative statement concerned B, now it concerns C. Similarly if one premiss is not universal: for the middle term is always that which is stated negatively of one extreme, and affirmatively of the other. Consequently it is possible that

contradictories may lead to a conclusion, though not always or in every mood, but only if the terms subordinate to the middle are such that they are either identical or related as whole to part. Otherwise it is impossible: for the premisses cannot anyhow be either contraries or contradictories.

In the third figure an affirmative syllogism can never be made out of opposite premisses, for the reason given in reference to the first figure; but a negative syllogism is possible whether the terms are universal or not. Let B and C stand for science, A for medicine. If then one should assume that all medicine is science and that no medicine is science, he has assumed that B belongs to all A and C to no A, so that a particular science will not be a science. Similarly if the premiss BA is not assumed universally. For if some medicine is science and again no medicine is science, it results that some science is not science, The premisses are contrary if the terms are taken universally; if one is particular, they are contradictory.

We must recognize that it is possible to take opposites in the way we said, viz. 'all science is good' and 'no science is good' or 'some science is not good'. This does not usually escape notice. But it is possible to establish one part of a contradiction through other premisses, or to assume it in the way suggested in the Topics. Since there are three oppositions to affirmative statements, it follows that opposite statements may be assumed as premisses in six ways; we may have either universal affirmative and negative, or universal affirmative and particular negative, or particular affirmative and universal negative, and the relations between the terms may be reversed; e.g. A may belong to all B and to no C, or to all C and to no B, or to all of the one, not to all of the other; here too the relation between the terms may be reversed. Similarly in the third figure. So it is clear in how many ways and in what figures a

syllogism can be made by means of premisses which are opposed.

It is clear too that from false premisses it is possible to draw a true conclusion, as has been said before, but it is not possible if the premisses are opposed. For the syllogism is always contrary to the fact, e.g. if a thing is good, it is proved that it is not good, if an animal, that it is not an animal because the syllogism springs out of a contradiction and the terms presupposed are either identical or related as whole and part. It is evident also that in fallacious reasonings nothing prevents a contradiction to the hypothesis from resulting, e.g. if something is odd, it is not odd. For the syllogism owed its contrariety to its contradictory premisses; if we assume such premisses we shall get a result that contradicts our hypothesis. But we must recognize that contraries cannot be inferred from a single syllogism in such a way that we conclude that what is not good is good, or anything of that sort unless a self-contradictory premiss is at once assumed, e.g. 'every animal is white and not white', and we proceed 'man is an animal'. Either we must introduce the contradiction by an additional assumption, assuming, e.g., that every science is supposition, and then assuming 'Medicine is a science, but none of it is supposition' (which is the mode in which refutations are made), or we must argue from two syllogisms. In no other way than this, as was said before, is it possible that the premisses should be really contrary.

16

To beg and assume the original question is a species of failure to demonstrate the problem proposed; but this happens in many ways. A man may not reason syllogistically at all, or he

may argue from premisses which are less known or equally unknown, or he may establish the antecedent by means of its consequents; for demonstration proceeds from what is more certain and is prior. Now begging the question is none of these: but since we get to know some things naturally through themselves, and other things by means of something else (the first principles through themselves, what is subordinate to them through something else), whenever a man tries to prove what is not self-evident by means of itself, then he begs the original question. This may be done by assuming what is in question at once; it is also possible to make a transition to other things which would naturally be proved through the thesis proposed, and demonstrate it through them, e.g. if A should be proved through B, and B through C, though it was natural that C should be proved through A: for it turns out that those who reason thus are proving A by means of itself. This is what those persons do who suppose that they are constructing parallel straight lines: for they fail to see that they are assuming facts which it is impossible to demonstrate unless the parallels exist. So it turns out that those who reason thus merely say a particular thing is, if it is: in this way everything will be self-evident. But that is impossible.

If then it is uncertain whether A belongs to C, and also whether A belongs to B, and if one should assume that A does belong to B, it is not yet clear whether he begs the original question, but it is evident that he is not demonstrating: for what is as uncertain as the question to be answered cannot be a principle of a demonstration. If however B is so related to C that they are identical, or if they are plainly convertible, or the one belongs to the other, the original question is begged. For one might equally well prove that A belongs to B through those terms if they are convertible. But if they are not convertible, it is the fact that they are not that prevents such a demonstration, not the method of demonstrating. But if one were to make the conversion, then he

would be doing what we have described and effecting a reciprocal proof with three propositions.

Similarly if he should assume that B belongs to C, this being as uncertain as the question whether A belongs to C, the question is not yet begged, but no demonstration is made. If however A and B are identical either because they are convertible or because A follows B, then the question is begged for the same reason as before. For we have explained the meaning of begging the question, viz. proving that which is not self-evident by means of itself.

If then begging the question is proving what is not self-evident by means of itself, in other words failing to prove when the failure is due to the thesis to be proved and the premiss through which it is proved being equally uncertain, either because predicates which are identical belong to the same subject, or because the same predicate belongs to subjects which are identical, the question may be begged in the middle and third figures in both ways, though, if the syllogism is affirmative, only in the third and first figures. If the syllogism is negative, the question is begged when identical predicates are denied of the same subject; and both premisses do not beg the question indifferently (in a similar way the question may be begged in the middle figure), because the terms in negative syllogisms are not convertible. In scientific demonstrations the question is begged when the terms are really related in the manner described, in dialectical arguments when they are according to common opinion so related.

17

The objection that 'this is not the reason why the result is false', which we frequently make in argument, is made primarily in the case of a reductio ad impossibile, to rebut the proposition which was being proved by the reduction. For unless a man has contradicted this proposition he will not say, 'False cause', but urge that something false has been assumed in the earlier parts of the argument; nor will he use the formula in the case of an ostensive proof; for here what one denies is not assumed as a premiss. Further when anything is refuted ostensively by the terms ABC, it cannot be objected that the syllogism does not depend on the assumption laid down. For we use the expression 'false cause', when the syllogism is concluded in spite of the refutation of this position; but that is not possible in ostensive proofs: since if an assumption is refuted, a syllogism can no longer be drawn in reference to it. It is clear then that the expression 'false cause' can only be used in the case of a reductio ad impossibile, and when the original hypothesis is so related to the impossible conclusion, that the conclusion results indifferently whether the hypothesis is made or not. The most obvious case of the irrelevance of an assumption to a conclusion which is false is when a syllogism drawn from middle terms to an impossible conclusion is independent of the hypothesis, as we have explained in the Topics. For to put that which is not the cause as the cause, is just this: e.g. if a man, wishing to prove that the diagonal of the square is incommensurate with the side, should try to prove Zeno's theorem that motion is impossible, and so establish a reductio ad impossibile: for Zeno's false theorem has no connexion at all with the original assumption. Another case is where the impossible conclusion is connected with the hypothesis, but does not result from it. This may happen whether one traces the connexion upwards or downwards, e.g. if it is laid down that A belongs to B, B to C, and C to D, and it should be false that B

belongs to D: for if we eliminated A and assumed all the same that B belongs to C and C to D, the false conclusion would not depend on the original hypothesis. Or again trace the connexion upwards; e.g. suppose that A belongs to B, E to A and F to E, it being false that F belongs to A. In this way too the impossible conclusion would result, though the original hypothesis were eliminated. But the impossible conclusion ought to be connected with the original terms: in this way it will depend on the hypothesis, e.g. when one traces the connexion downwards, the impossible conclusion must be connected with that term which is predicate in the hypothesis: for if it is impossible that A should belong to D, the false conclusion will no longer result after A has been eliminated. If one traces the connexion upwards, the impossible conclusion must be connected with that term which is subject in the hypothesis: for if it is impossible that F should belong to B, the impossible conclusion will disappear if B is eliminated. Similarly when the syllogisms are negative.

It is clear then that when the impossibility is not related to the original terms, the false conclusion does not result on account of the assumption. Or perhaps even so it may sometimes be independent. For if it were laid down that A belongs not to B but to K, and that K belongs to C and C to D, the impossible conclusion would still stand. Similarly if one takes the terms in an ascending series. Consequently since the impossibility results whether the first assumption is suppressed or not, it would appear to be independent of that assumption. Or perhaps we ought not to understand the statement that the false conclusion results independently of the assumption, in the sense that if something else were supposed the impossibility would result; but rather we mean that when the first assumption is eliminated, the same impossibility results through the remaining premisses; since it is not perhaps absurd that the same false result should follow from several

hypotheses, e.g. that parallels meet, both on the assumption that the interior angle is greater than the exterior and on the assumption that a triangle contains more than two right angles.

18

A false argument depends on the first false statement in it. Every syllogism is made out of two or more premisses. If then the false conclusion is drawn from two premisses, one or both of them must be false: for (as we proved) a false syllogism cannot be drawn from two premisses. But if the premisses are more than two, e.g. if C is established through A and B, and these through D, E, F, and G, one of these higher propositions must be false, and on this the argument depends: for A and B are inferred by means of D, E, F, and G. Therefore the conclusion and the error results from one of them.

19

In order to avoid having a syllogism drawn against us we must take care, whenever an opponent asks us to admit the reason without the conclusions, not to grant him the same term twice over in his premisses, since we know that a syllogism cannot be drawn without a middle term, and that term which is stated more than once is the middle. How we ought to watch the middle in reference to each conclusion, is evident from our knowing what kind of thesis is proved in each figure. This will not escape us since we know how we are maintaining the argument.

That which we urge men to beware of in their admissions, they ought in attack to try to conceal. This will be possible first, if, instead of drawing the conclusions of preliminary syllogisms, they take the necessary premisses and leave the conclusions in the dark; secondly if instead of inviting assent to propositions which are closely connected they take as far as possible those that are not connected by middle terms. For example suppose that A is to be inferred to be true of F, B, C, D, and E being middle terms. One ought then to ask whether A belongs to B, and next whether D belongs to E, instead of asking whether B belongs to C; after that he may ask whether B belongs to C, and so on. If the syllogism is drawn through one middle term, he ought to begin with that: in this way he will most likely deceive his opponent.

20

Since we know when a syllogism can be formed and how its terms must be related, it is clear when refutation will be possible and when impossible. A refutation is possible whether everything is conceded, or the answers alternate (one, I mean, being affirmative, the other negative). For as has been shown a syllogism is possible whether the terms are related in affirmative propositions or one proposition is affirmative, the other negative: consequently, if what is laid down is contrary to the conclusion, a refutation must take place: for a refutation is a syllogism which establishes the contradictory. But if nothing is conceded, a refutation is impossible: for no syllogism is possible (as we saw) when all the terms are negative: therefore no refutation is possible. For if a refutation were possible, a syllogism must be possible; although if a syllogism is possible it does not follow that a refutation is possible. Similarly refutation

is not possible if nothing is conceded universally: since the fields of refutation and syllogism are defined in the same way.

21

It sometimes happens that just as we are deceived in the arrangement of the terms, so error may arise in our thought about them, e.g. if it is possible that the same predicate should belong to more than one subject immediately, but although knowing the one, a man may forget the other and think the opposite true. Suppose that A belongs to B and to C in virtue of their nature, and that B and C belong to all D in the same way. If then a man thinks that A belongs to all B, and B to D, but A to no C, and C to all D, he will both know and not know the same thing in respect of the same thing. Again if a man were to make a mistake about the members of a single series; e.g. suppose A belongs to B, B to C, and C to D, but some one thinks that A belongs to all B, but to no C: he will both know that A belongs to D, and think that it does not. Does he then maintain after this simply that what he knows, he does not think? For he knows in a way that A belongs to C through B, since the part is included in the whole; so that what he knows in a way, this he maintains he does not think at all: but that is impossible.

In the former case, where the middle term does not belong to the same series, it is not possible to think both the premisses with reference to each of the two middle terms: e.g. that A belongs to all B, but to no C, and both B and C belong to all D. For it turns out that the first premiss of the one syllogism is either wholly or partially contrary to the first premiss of the other. For if he thinks that A belongs to everything to which B belongs, and he knows that B belongs to D, then he knows that

A belongs to D. Consequently if again he thinks that A belongs to nothing to which C belongs, he thinks that A does not belong to some of that to which B belongs; but if he thinks that A belongs to everything to which B belongs, and again thinks that A does not belong to some of that to which B belongs, these beliefs are wholly or partially contrary. In this way then it is not possible to think; but nothing prevents a man thinking one premiss of each syllogism of both premisses of one of the two syllogisms: e.g. A belongs to all B, and B to D, and again A belongs to no C. An error of this kind is similar to the error into which we fall concerning particulars: e.g. if A belongs to all B, and B to all C, A will belong to all C. If then a man knows that A belongs to everything to which B belongs, he knows that A belongs to C. But nothing prevents his being ignorant that C exists; e.g. let A stand for two right angles, B for triangle, C for a particular diagram of a triangle. A man might think that C did not exist, though he knew that every triangle contains two right angles; consequently he will know and not know the same thing at the same time. For the expression 'to know that every triangle has its angles equal to two right angles' is ambiguous, meaning to have the knowledge either of the universal or of the particulars. Thus then he knows that C contains two right angles with a knowledge of the universal, but not with a knowledge of the particulars; consequently his knowledge will not be contrary to his ignorance. The argument in the Meno that learning is recollection may be criticized in a similar way. For it never happens that a man starts with a foreknowledge of the particular, but along with the process of being led to see the general principle he receives a knowledge of the particulars, by an act (as it were) of recognition. For we know some things directly; e.g. that the angles are equal to two right angles, if we know that the figure is a triangle. Similarly in all other cases.

By a knowledge of the universal then we see the particulars, but we do not know them by the kind of knowledge which is proper

to them; consequently it is possible that we may make mistakes about them, but not that we should have the knowledge and error that are contrary to one another: rather we have the knowledge of the universal but make a mistake in apprehending the particular. Similarly in the cases stated above. The error in respect of the middle term is not contrary to the knowledge obtained through the syllogism, nor is the thought in respect of one middle term contrary to that in respect of the other. Nothing prevents a man who knows both that A belongs to the whole of B, and that B again belongs to C, thinking that A does not belong to C, e.g. knowing that every mule is sterile and that this is a mule, and thinking that this animal is with foal: for he does not know that A belongs to C, unless he considers the two propositions together. So it is evident that if he knows the one and does not know the other, he will fall into error. And this is the relation of knowledge of the universal to knowledge of the particular. For we know no sensible thing, once it has passed beyond the range of our senses, even if we happen to have perceived it, except by means of the universal and the possession of the knowledge which is proper to the particular, but without the actual exercise of that knowledge. For to know is used in three senses: it may mean either to have knowledge of the universal or to have knowledge proper to the matter in hand or to exercise such knowledge: consequently three kinds of error also are possible. Nothing then prevents a man both knowing and being mistaken about the same thing, provided that his knowledge and his error are not contrary. And this happens also to the man whose knowledge is limited to each of the premisses and who has not previously considered the particular question. For when he thinks that the mule is with foal he has not the knowledge in the sense of its actual exercise, nor on the other hand has his thought caused an error contrary to his knowledge: for the error contrary to the knowledge of the universal would be a syllogism.

But he who thinks the essence of good is the essence of bad will think the same thing to be the essence of good and the essence of bad. Let A stand for the essence of good and B for the essence of bad, and again C for the essence of good. Since then he thinks B and C identical, he will think that C is B, and similarly that B is A, consequently that C is A. For just as we saw that if B is true of all of which C is true, and A is true of all of which B is true, A is true of C, similarly with the word 'think'. Similarly also with the word 'is'; for we saw that if C is the same as B, and B as A, C is the same as A. Similarly therefore with 'opine'. Perhaps then this is necessary if a man will grant the first point. But presumably that is false, that any one could suppose the essence of good to be the essence of bad, save incidentally. For it is possible to think this in many different ways. But we must consider this matter better.

22

Whenever the extremes are convertible it is necessary that the middle should be convertible with both. For if A belongs to C through B, then if A and C are convertible and C belongs everything to which A belongs, B is convertible with A, and B belongs to everything to which A belongs, through C as middle, and C is convertible with B through A as middle. Similarly if the conclusion is negative, e.g. if B belongs to C, but A does not belong to B, neither will A belong to C. If then B is convertible with A, C will be convertible with A. Suppose B does not belong to A; neither then will C: for ex hypothesi B belonged to all C. And if C is convertible with B, B is convertible also with A, for C is said of that of all of which B is said. And if C is convertible in relation to A and to B, B also is convertible in relation to A. For C belongs to that to which B belongs: but C does not belong to

that to which A belongs. And this alone starts from the conclusion; the preceding moods do not do so as in the affirmative syllogism. Again if A and B are convertible, and similarly C and D, and if A or C must belong to anything whatever, then B and D will be such that one or other belongs to anything whatever. For since B belongs to that to which A belongs, and D belongs to that to which C belongs, and since A or C belongs to everything, but not together, it is clear that B or D belongs to everything, but not together. For example if that which is uncreated is incorruptible and that which is incorruptible is uncreated, it is necessary that what is created should be corruptible and what is corruptible should have been created. For two syllogisms have been put together. Again if A or B belongs to everything and if C or D belongs to everything, but they cannot belong together, then when A and C are convertible B and D are convertible. For if B does not belong to something to which D belongs, it is clear that A belongs to it. But if A then C: for they are convertible. Therefore C and D belong together. But this is impossible. When A belongs to the whole of B and to C and is affirmed of nothing else, and B also belongs to all C, it is necessary that A and B should be convertible: for since A is said of B and C only, and B is affirmed both of itself and of C, it is clear that B will be said of everything of which A is said, except A itself. Again when A and B belong to the whole of C, and C is convertible with B, it is necessary that A should belong to all B: for since A belongs to all C, and C to B by conversion, A will belong to all B.

When, of two opposites A and B, A is preferable to B, and similarly D is preferable to C, then if A and C together are preferable to B and D together, A must be preferable to D. For A is an object of desire to the same extent as B is an object of aversion, since they are opposites: and C is similarly related to D, since they also are opposites. If then A is an object of desire to the same extent as D, B is an object of aversion to the same

extent as C (since each is to the same extent as each – the one an object of aversion, the other an object of desire). Therefore both A and C together, and B and D together, will be equally objects of desire or aversion. But since A and C are preferable to B and D, A cannot be equally desirable with D; for then B along with D would be equally desirable with A along with C. But if D is preferable to A, then B must be less an object of aversion than C: for the less is opposed to the less. But the greater good and lesser evil are preferable to the lesser good and greater evil: the whole BD then is preferable to the whole AC. But ex hypothesi this is not so. A then is preferable to D, and C consequently is less an object of aversion than B. If then every lover in virtue of his love would prefer A, viz. that the beloved should be such as to grant a favour, and yet should not grant it (for which C stands), to the beloved's granting the favour (represented by D) without being such as to grant it (represented by B), it is clear that A (being of such a nature) is preferable to granting the favour. To receive affection then is preferable in love to sexual intercourse. Love then is more dependent on friendship than on intercourse. And if it is most dependent on receiving affection, then this is its end. Intercourse then either is not an end at all or is an end relative to the further end, the receiving of affection. And indeed the same is true of the other desires and arts.

23

It is clear then how the terms are related in conversion, and in respect of being in a higher degree objects of aversion or of desire. We must now state that not only dialectical and demonstrative syllogisms are formed by means of the aforesaid figures, but also rhetorical syllogisms and in general any form of

persuasion, however it may be presented. For every belief comes either through syllogism or from induction.

Now induction, or rather the syllogism which springs out of induction, consists in establishing syllogistically a relation between one extreme and the middle by means of the other extreme, e.g. if B is the middle term between A and C, it consists in proving through C that A belongs to B. For this is the manner in which we make inductions. For example let A stand for long-lived, B for bileless, and C for the particular long-lived animals, e.g. man, horse, mule. A then belongs to the whole of C: for whatever is bileless is long-lived. But B also ('not possessing bile') belongs to all C. If then C is convertible with B, and the middle term is not wider in extension, it is necessary that A should belong to B. For it has already been proved that if two things belong to the same thing, and the extreme is convertible with one of them, then the other predicate will belong to the predicate that is converted. But we must apprehend C as made up of all the particulars. For induction proceeds through an enumeration of all the cases.

Such is the syllogism which establishes the first and immediate premiss: for where there is a middle term the syllogism proceeds through the middle term; when there is no middle term, through induction. And in a way induction is opposed to syllogism: for the latter proves the major term to belong to the third term by means of the middle, the former proves the major to belong to the middle by means of the third. In the order of nature, syllogism through the middle term is prior and better known, but syllogism through induction is clearer to us.

24

We have an 'example' when the major term is proved to belong to the middle by means of a term which resembles the third. It ought to be known both that the middle belongs to the third term, and that the first belongs to that which resembles the third. For example let A be evil, B making war against neighbours, C Athenians against Thebans, D Thebans against Phocians. If then we wish to prove that to fight with the Thebans is an evil, we must assume that to fight against neighbours is an evil. Evidence of this is obtained from similar cases, e.g. that the war against the Phocians was an evil to the Thebans. Since then to fight against neighbours is an evil, and to fight against the Thebans is to fight against neighbours, it is clear that to fight against the Thebans is an evil. Now it is clear that B belongs to C and to D (for both are cases of making war upon one's neighbours) and that A belongs to D (for the war against the Phocians did not turn out well for the Thebans): but that A belongs to B will be proved through D. Similarly if the belief in the relation of the middle term to the extreme should be produced by several similar cases. Clearly then to argue by example is neither like reasoning from part to whole, nor like reasoning from whole to part, but rather reasoning from part to part, when both particulars are subordinate to the same term, and one of them is known. It differs from induction, because induction starting from all the particular cases proves (as we saw) that the major term belongs to the middle, and does not apply the syllogistic conclusion to the minor term, whereas argument by example does make this application and does not draw its proof from all the particular cases.

25

By reduction we mean an argument in which the first term clearly belongs to the middle, but the relation of the middle to the last term is uncertain though equally or more probable than the conclusion; or again an argument in which the terms intermediate between the last term and the middle are few. For in any of these cases it turns out that we approach more nearly to knowledge. For example let A stand for what can be taught, B for knowledge, C for justice. Now it is clear that knowledge can be taught: but it is uncertain whether virtue is knowledge. If now the statement BC is equally or more probable than AC, we have a reduction: for we are nearer to knowledge, since we have taken a new term, being so far without knowledge that A belongs to C. Or again suppose that the terms intermediate between B and C are few: for thus too we are nearer knowledge. For example let D stand for squaring, E for rectilinear figure, F for circle. If there were only one term intermediate between E and F (viz. that the circle is made equal to a rectilinear figure by the help of lunules), we should be near to knowledge. But when BC is not more probable than AC, and the intermediate terms are not few, I do not call this reduction: nor again when the statement BC is immediate: for such a statement is knowledge.

26

An objection is a premiss contrary to a premiss. It differs from a premiss, because it may be particular, but a premiss either cannot be particular at all or not in universal syllogisms. An objection is brought in two ways and through two figures; in two ways because every objection is either universal or particular, by two figures because objections are brought in

opposition to the premiss, and opposites can be proved only in the first and third figures. If a man maintains a universal affirmative, we reply with a universal or a particular negative; the former is proved from the first figure, the latter from the third. For example let stand for there being a single science, B for contraries. If a man premises that contraries are subjects of a single science, the objection may be either that opposites are never subjects of a single science, and contraries are opposites, so that we get the first figure, or that the knowable and the unknowable are not subjects of a single science: this proof is in the third figure: for it is true of C (the knowable and the unknowable) that they are contraries, and it is false that they are the subjects of a single science.

Similarly if the premiss objected to is negative. For if a man maintains that contraries are not subjects of a single science, we reply either that all opposites or that certain contraries, e.g. what is healthy and what is sickly, are subjects of the same science: the former argument issues from the first, the latter from the third figure.

In general if a man urges a universal objection he must frame his contradiction with reference to the universal of the terms taken by his opponent, e.g. if a man maintains that contraries are not subjects of the same science, his opponent must reply that there is a single science of all opposites. Thus we must have the first figure: for the term which embraces the original subject becomes the middle term.

If the objection is particular, the objector must frame his contradiction with reference to a term relatively to which the subject of his opponent's premiss is universal, e.g. he will point out that the knowable and the unknowable are not subjects of the same science: 'contraries' is universal relatively to these. And we have the third figure: for the particular term assumed is

middle, e.g. the knowable and the unknowable. Premisses from which it is possible to draw the contrary conclusion are what we start from when we try to make objections. Consequently we bring objections in these figures only: for in them only are opposite syllogisms possible, since the second figure cannot produce an affirmative conclusion.

Besides, an objection in the middle figure would require a fuller argument, e.g. if it should not be granted that A belongs to B, because C does not follow B. This can be made clear only by other premisses. But an objection ought not to turn off into other things, but have its new premiss quite clear immediately. For this reason also this is the only figure from which proof by signs cannot be obtained.

We must consider later the other kinds of objection, namely the objection from contraries, from similars, and from common opinion, and inquire whether a particular objection cannot be elicited from the first figure or a negative objection from the second.

27

A probability and a sign are not identical, but a probability is a generally approved proposition: what men know to happen or not to happen, to be or not to be, for the most part thus and thus, is a probability, e.g. 'the envious hate', 'the beloved show affection'. A sign means a demonstrative proposition necessary or generally approved: for anything such that when it is another thing is, or when it has come into being the other has come into being before or after, is a sign of the other's being or having come into being. Now an enthymeme is a syllogism starting from probabilities or signs, and a sign may be taken in three

ways, corresponding to the position of the middle term in the figures. For it may be taken as in the first figure or the second or the third. For example the proof that a woman is with child because she has milk is in the first figure: for to have milk is the middle term. Let A represent to be with child, B to have milk, C woman. The proof that wise men are good, since Pittacus is good, comes through the last figure. Let A stand for good, B for wise men, C for Pittacus. It is true then to affirm both A and B of C: only men do not say the latter, because they know it, though they state the former. The proof that a woman is with child because she is pale is meant to come through the middle figure: for since paleness follows women with child and is a concomitant of this woman, people suppose it has been proved that she is with child. Let A stand for paleness, B for being with child, C for woman. Now if the one proposition is stated, we have only a sign, but if the other is stated as well, a syllogism, e.g. 'Pittacus is generous, since ambitious men are generous and Pittacus is ambitious.' Or again 'Wise men are good, since Pittacus is not only good but wise.' In this way then syllogisms are formed, only that which proceeds through the first figure is irrefutable if it is true (for it is universal), that which proceeds through the last figure is refutable even if the conclusion is true, since the syllogism is not universal nor correlative to the matter in question: for though Pittacus is good, it is not therefore necessary that all other wise men should be good. But the syllogism which proceeds through the middle figure is always refutable in any case: for a syllogism can never be formed when the terms are related in this way: for though a woman with child is pale, and this woman also is pale, it is not necessary that she should be with child. Truth then may be found in signs whatever their kind, but they have the differences we have stated.

We must either divide signs in the way stated, and among them designate the middle term as the index (for people call that the

index which makes us know, and the middle term above all has this character), or else we must call the arguments derived from the extremes signs, that derived from the middle term the index: for that which is proved through the first figure is most generally accepted and most true.

It is possible to infer character from features, if it is granted that the body and the soul are changed together by the natural affections: I say 'natural', for though perhaps by learning music a man has made some change in his soul, this is not one of those affections which are natural to us; rather I refer to passions and desires when I speak of natural emotions. If then this were granted and also that for each change there is a corresponding sign, and we could state the affection and sign proper to each kind of animal, we shall be able to infer character from features. For if there is an affection which belongs properly to an individual kind, e.g. courage to lions, it is necessary that there should be a sign of it: for ex hypothesi body and soul are affected together. Suppose this sign is the possession of large extremities: this may belong to other kinds also though not universally. For the sign is proper in the sense stated, because the affection is proper to the whole kind, though not proper to it alone, according to our usual manner of speaking. The same thing then will be found in another kind, and man may be brave, and some other kinds of animal as well. They will then have the sign: for ex hypothesi there is one sign corresponding to each affection. If then this is so, and we can collect signs of this sort in these animals which have only one affection proper to them – but each affection has its sign, since it is necessary that it should have a single sign – we shall then be able to infer character from features. But if the kind as a whole has two properties, e.g. if the lion is both brave and generous, how shall we know which of the signs which are its proper concomitants is the sign of a particular affection? Perhaps if both belong to some other kind though not to the

whole of it, and if, in those kinds in which each is found though not in the whole of their members, some members possess one of the affections and not the other: e.g. if a man is brave but not generous, but possesses, of the two signs, large extremities, it is clear that this is the sign of courage in the lion also. To judge character from features, then, is possible in the first figure if the middle term is convertible with the first extreme, but is wider than the third term and not convertible with it: e.g. let A stand for courage, B for large extremities, and C for lion. B then belongs to everything to which C belongs, but also to others. But A belongs to everything to which B belongs, and to nothing besides, but is convertible with B: otherwise, there would not be a single sign correlative with each affection.

Aristotle - Posterior Analytics

[Translated by G. R. G. Mure]

Book I

1

All instruction given or received by way of argument proceeds from pre-existent knowledge. This becomes evident upon a survey of all the species of such instruction. The mathematical sciences and all other speculative disciplines are acquired in this way, and so are the two forms of dialectical reasoning, syllogistic and inductive; for each of these latter make use of old knowledge to impart new, the syllogism assuming an audience that accepts its premisses, induction exhibiting the universal as implicit in the clearly known particular. Again, the persuasion exerted by rhetorical arguments is in principle the same, since they use either example, a kind of induction, or enthymeme, a form of syllogism.

The pre-existent knowledge required is of two kinds. In some cases admission of the fact must be assumed, in others comprehension of the meaning of the term used, and sometimes both assumptions are essential. Thus, we assume that every predicate can be either truly affirmed or truly denied of any subject, and that 'triangle' means so and so; as regards 'unit' we have to make the double assumption of the meaning of the word and the existence of the thing. The reason is that these several objects are not equally obvious to us. Recognition of a truth may in some cases contain as factors both previous knowledge and also knowledge acquired simultaneously with

that recognition – knowledge, this latter, of the particulars actually falling under the universal and therein already virtually known. For example, the student knew beforehand that the angles of every triangle are equal to two right angles; but it was only at the actual moment at which he was being led on to recognize this as true in the instance before him that he came to know 'this figure inscribed in the semicircle' to be a triangle. For some things (viz. the singulars finally reached which are not predicable of anything else as subject) are only learnt in this way, i.e. there is here no recognition through a middle of a minor term as subject to a major. Before he was led on to recognition or before he actually drew a conclusion, we should perhaps say that in a manner he knew, in a manner not.

If he did not in an unqualified sense of the term know the existence of this triangle, how could he know without qualification that its angles were equal to two right angles? No: clearly he knows not without qualification but only in the sense that he knows universally. If this distinction is not drawn, we are faced with the dilemma in the Meno: either a man will learn nothing or what he already knows; for we cannot accept the solution which some people offer. A man is asked, 'Do you, or do you not, know that every pair is even?' He says he does know it. The questioner then produces a particular pair, of the existence, and so a fortiori of the evenness, of which he was unaware. The solution which some people offer is to assert that they do not know that every pair is even, but only that everything which they know to be a pair is even: yet what they know to be even is that of which they have demonstrated evenness, i.e. what they made the subject of their premiss, viz. not merely every triangle or number which they know to be such, but any and every number or triangle without reservation. For no premiss is ever couched in the form 'every number which you know to be such', or 'every rectilinear figure which you know to be such': the predicate is always construed as applicable to any and every

instance of the thing. On the other hand, I imagine there is nothing to prevent a man in one sense knowing what he is learning, in another not knowing it. The strange thing would be, not if in some sense he knew what he was learning, but if he were to know it in that precise sense and manner in which he was learning it.

2

We suppose ourselves to possess unqualified scientific knowledge of a thing, as opposed to knowing it in the accidental way in which the sophist knows, when we think that we know the cause on which the fact depends, as the cause of that fact and of no other, and, further, that the fact could not be other than it is. Now that scientific knowing is something of this sort is evident – witness both those who falsely claim it and those who actually possess it, since the former merely imagine themselves to be, while the latter are also actually, in the condition described. Consequently the proper object of unqualified scientific knowledge is something which cannot be other than it is.

There may be another manner of knowing as well – that will be discussed later. What I now assert is that at all events we do know by demonstration. By demonstration I mean a syllogism productive of scientific knowledge, a syllogism, that is, the grasp of which is eo ipso such knowledge. Assuming then that my thesis as to the nature of scientific knowing is correct, the premisses of demonstrated knowledge must be true, primary, immediate, better known than and prior to the conclusion, which is further related to them as effect to cause. Unless these conditions are satisfied, the basic truths will not be

‘appropriate’ to the conclusion. Syllogism there may indeed be without these conditions, but such syllogism, not being productive of scientific knowledge, will not be demonstration. The premisses must be true: for that which is non-existent cannot be known – we cannot know, e.g. that the diagonal of a square is commensurate with its side. The premisses must be primary and indemonstrable; otherwise they will require demonstration in order to be known, since to have knowledge, if it be not accidental knowledge, of things which are demonstrable, means precisely to have a demonstration of them. The premisses must be the causes of the conclusion, better known than it, and prior to it; its causes, since we possess scientific knowledge of a thing only when we know its cause; prior, in order to be causes; antecedently known, this antecedent knowledge being not our mere understanding of the meaning, but knowledge of the fact as well. Now ‘prior’ and ‘better known’ are ambiguous terms, for there is a difference between what is prior and better known in the order of being and what is prior and better known to man. I mean that objects nearer to sense are prior and better known to man; objects without qualification prior and better known are those further from sense. Now the most universal causes are furthest from sense and particular causes are nearest to sense, and they are thus exactly opposed to one another. In saying that the premisses of demonstrated knowledge must be primary, I mean that they must be the ‘appropriate’ basic truths, for I identify primary premiss and basic truth. A ‘basic truth’ in a demonstration is an immediate proposition. An immediate proposition is one which has no other proposition prior to it. A proposition is either part of an enunciation, i.e. it predicates a single attribute of a single subject. If a proposition is dialectical, it assumes either part indifferently; if it is demonstrative, it lays down one part to the definite exclusion of the other because that part is true. The term ‘enunciation’ denotes either part of a

contradiction indifferently. A contradiction is an opposition which of its own nature excludes a middle. The part of a contradiction which conjoins a predicate with a subject is an affirmation; the part disjoining them is a negation. I call an immediate basic truth of syllogism a 'thesis' when, though it is not susceptible of proof by the teacher, yet ignorance of it does not constitute a total bar to progress on the part of the pupil: one which the pupil must know if he is to learn anything whatever is an axiom. I call it an axiom because there are such truths and we give them the name of axioms par excellence. If a thesis assumes one part or the other of an enunciation, i.e. asserts either the existence or the non-existence of a subject, it is a hypothesis; if it does not so assert, it is a definition. Definition is a 'thesis' or a 'laying something down', since the arithmetician lays it down that to be a unit is to be quantitatively indivisible; but it is not a hypothesis, for to define what a unit is is not the same as to affirm its existence.

Now since the required ground of our knowledge – i.e. of our conviction – of a fact is the possession of such a syllogism as we call demonstration, and the ground of the syllogism is the facts constituting its premisses, we must not only know the primary premisses – some if not all of them – beforehand, but know them better than the conclusion: for the cause of an attribute's inherence in a subject always itself inheres in the subject more firmly than that attribute; e.g. the cause of our loving anything is dearer to us than the object of our love. So since the primary premisses are the cause of our knowledge – i.e. of our conviction – it follows that we know them better – that is, are more convinced of them – than their consequences, precisely because of our knowledge of the latter is the effect of our knowledge of the premisses. Now a man cannot believe in anything more than in the things he knows, unless he has either actual knowledge of it or something better than actual knowledge. But we are faced with this paradox if a student whose belief rests

on demonstration has not prior knowledge; a man must believe in some, if not in all, of the basic truths more than in the conclusion. Moreover, if a man sets out to acquire the scientific knowledge that comes through demonstration, he must not only have a better knowledge of the basic truths and a firmer conviction of them than of the connexion which is being demonstrated: more than this, nothing must be more certain or better known to him than these basic truths in their character as contradicting the fundamental premisses which lead to the opposed and erroneous conclusion. For indeed the conviction of pure science must be unshakable.

3

Some hold that, owing to the necessity of knowing the primary premisses, there is no scientific knowledge. Others think there is, but that all truths are demonstrable. Neither doctrine is either true or a necessary deduction from the premisses. The first school, assuming that there is no way of knowing other than by demonstration, maintain that an infinite regress is involved, on the ground that if behind the prior stands no primary, we could not know the posterior through the prior (wherein they are right, for one cannot traverse an infinite series): if on the other hand – they say – the series terminates and there are primary premisses, yet these are unknowable because incapable of demonstration, which according to them is the only form of knowledge. And since thus one cannot know the primary premisses, knowledge of the conclusions which follow from them is not pure scientific knowledge nor properly knowing at all, but rests on the mere supposition that the premisses are true. The other party agree with them as regards knowing, holding that it is only possible by demonstration, but

they see no difficulty in holding that all truths are demonstrated, on the ground that demonstration may be circular and reciprocal.

Our own doctrine is that not all knowledge is demonstrative: on the contrary, knowledge of the immediate premisses is independent of demonstration. (The necessity of this is obvious; for since we must know the prior premisses from which the demonstration is drawn, and since the regress must end in immediate truths, those truths must be indemonstrable.) Such, then, is our doctrine, and in addition we maintain that besides scientific knowledge there is its originative source which enables us to recognize the definitions.

Now demonstration must be based on premisses prior to and better known than the conclusion; and the same things cannot simultaneously be both prior and posterior to one another: so circular demonstration is clearly not possible in the unqualified sense of 'demonstration', but only possible if 'demonstration' be extended to include that other method of argument which rests on a distinction between truths prior to us and truths without qualification prior, i.e. the method by which induction produces knowledge. But if we accept this extension of its meaning, our definition of unqualified knowledge will prove faulty; for there seem to be two kinds of it. Perhaps, however, the second form of demonstration, that which proceeds from truths better known to us, is not demonstration in the unqualified sense of the term.

The advocates of circular demonstration are not only faced with the difficulty we have just stated: in addition their theory reduces to the mere statement that if a thing exists, then it does exist – an easy way of proving anything. That this is so can be clearly shown by taking three terms, for to constitute the circle it makes no difference whether many terms or few or even only two are taken. Thus by direct proof, if A is, B must be; if B is, C

must be; therefore if A is, C must be. Since then – by the circular proof – if A is, B must be, and if B is, A must be, A may be substituted for C above. Then 'if B is, A must be'='if B is, C must be', which above gave the conclusion 'if A is, C must be': but C and A have been identified. Consequently the upholders of circular demonstration are in the position of saying that if A is, A must be – a simple way of proving anything. Moreover, even such circular demonstration is impossible except in the case of attributes that imply one another, viz. 'peculiar' properties.

Now, it has been shown that the positing of one thing – be it one term or one premiss – never involves a necessary consequent: two premisses constitute the first and smallest foundation for drawing a conclusion at all and therefore a fortiori for the demonstrative syllogism of science. If, then, A is implied in B and C, and B and C are reciprocally implied in one another and in A, it is possible, as has been shown in my writings on the syllogism, to prove all the assumptions on which the original conclusion rested, by circular demonstration in the first figure. But it has also been shown that in the other figures either no conclusion is possible, or at least none which proves both the original premisses. Propositions the terms of which are not convertible cannot be circularly demonstrated at all, and since convertible terms occur rarely in actual demonstrations, it is clearly frivolous and impossible to say that demonstration is reciprocal and that therefore everything can be demonstrated.

4

Since the object of pure scientific knowledge cannot be other than it is, the truth obtained by demonstrative knowledge will be necessary. And since demonstrative knowledge is only

present when we have a demonstration, it follows that demonstration is an inference from necessary premisses. So we must consider what are the premisses of demonstration – i.e. what is their character: and as a preliminary, let us define what we mean by an attribute 'true in every instance of its subject', an 'essential' attribute, and a 'commensurate and universal' attribute. I call 'true in every instance' what is truly predicable of all instances – not of one to the exclusion of others – and at all times, not at this or that time only; e.g. if animal is truly predicable of every instance of man, then if it be true to say 'this is a man', 'this is an animal' is also true, and if the one be true now the other is true now. A corresponding account holds if point is in every instance predicable as contained in line. There is evidence for this in the fact that the objection we raise against a proposition put to us as true in every instance is either an instance in which, or an occasion on which, it is not true. Essential attributes are (1) such as belong to their subject as elements in its essential nature (e.g. line thus belongs to triangle, point to line; for the very being or 'substance' of triangle and line is composed of these elements, which are contained in the formulae defining triangle and line): (2) such that, while they belong to certain subjects, the subjects to which they belong are contained in the attribute's own defining formula. Thus straight and curved belong to line, odd and even, prime and compound, square and oblong, to number; and also the formula defining any one of these attributes contains its subject – e.g. line or number as the case may be.

Extending this classification to all other attributes, I distinguish those that answer the above description as belonging essentially to their respective subjects; whereas attributes related in neither of these two ways to their subjects I call accidents or 'coincidents'; e.g. musical or white is a 'coincident' of animal.

Further (a) that is essential which is not predicated of a subject other than itself: e.g. 'the walking [thing]' walks and is white in virtue of being something else besides; whereas substance, in the sense of whatever signifies a 'this somewhat', is not what it is in virtue of being something else besides. Things, then, not predicated of a subject I call essential; things predicated of a subject I call accidental or 'coincidental'.

In another sense again (b) a thing consequentially connected with anything is essential; one not so connected is 'coincidental'. An example of the latter is 'While he was walking it lightened': the lightning was not due to his walking; it was, we should say, a coincidence. If, on the other hand, there is a consequential connexion, the predication is essential; e.g. if a beast dies when its throat is being cut, then its death is also essentially connected with the cutting, because the cutting was the cause of death, not death a 'coincident' of the cutting.

So far then as concerns the sphere of connexions scientifically known in the unqualified sense of that term, all attributes which (within that sphere) are essential either in the sense that their subjects are contained in them, or in the sense that they are contained in their subjects, are necessary as well as consequentially connected with their subjects. For it is impossible for them not to inhere in their subjects either simply or in the qualified sense that one or other of a pair of opposites must inhere in the subject; e.g. in line must be either straightness or curvature, in number either oddness or evenness. For within a single identical genus the contrary of a given attribute is either its privative or its contradictory; e.g. within number what is not odd is even, inasmuch as within this sphere even is a necessary consequent of not-odd. So, since any given predicate must be either affirmed or denied of any subject, essential attributes must inhere in their subjects of necessity.

Thus, then, we have established the distinction between the attribute which is 'true in every instance' and the 'essential' attribute.

I term 'commensurately universal' an attribute which belongs to every instance of its subject, and to every instance essentially and as such; from which it clearly follows that all commensurate universals inhere necessarily in their subjects. The essential attribute, and the attribute that belongs to its subject as such, are identical. E.g. point and straight belong to line essentially, for they belong to line as such; and triangle as such has two right angles, for it is essentially equal to two right angles.

An attribute belongs commensurately and universally to a subject when it can be shown to belong to any random instance of that subject and when the subject is the first thing to which it can be shown to belong. Thus, e.g. (1) the equality of its angles to two right angles is not a commensurately universal attribute of figure. For though it is possible to show that a figure has its angles equal to two right angles, this attribute cannot be demonstrated of any figure selected at haphazard, nor in demonstrating does one take a figure at random – a square is a figure but its angles are not equal to two right angles. On the other hand, any isosceles triangle has its angles equal to two right angles, yet isosceles triangle is not the primary subject of this attribute but triangle is prior. So whatever can be shown to have its angles equal to two right angles, or to possess any other attribute, in any random instance of itself and primarily – that is the first subject to which the predicate in question belongs commensurately and universally, and the demonstration, in the essential sense, of any predicate is the proof of it as belonging to this first subject commensurately and universally: while the proof of it as belonging to the other subjects to which it attaches is demonstration only in a secondary and unessential

sense. Nor again (2) is equality to two right angles a commensurately universal attribute of isosceles; it is of wider application.

5

We must not fail to observe that we often fall into error because our conclusion is not in fact primary and commensurately universal in the sense in which we think we prove it so. We make this mistake (1) when the subject is an individual or individuals above which there is no universal to be found: (2) when the subjects belong to different species and there is a higher universal, but it has no name: (3) when the subject which the demonstrator takes as a whole is really only a part of a larger whole; for then the demonstration will be true of the individual instances within the part and will hold in every instance of it, yet the demonstration will not be true of this subject primarily and commensurately and universally. When a demonstration is true of a subject primarily and commensurately and universally, that is to be taken to mean that it is true of a given subject primarily and as such. Case (3) may be thus exemplified. If a proof were given that perpendiculars to the same line are parallel, it might be supposed that lines thus perpendicular were the proper subject of the demonstration because being parallel is true of every instance of them. But it is not so, for the parallelism depends not on these angles being equal to one another because each is a right angle, but simply on their being equal to one another. An example of (1) would be as follows: if isosceles were the only triangle, it would be thought to have its angles equal to two right angles qua isosceles. An instance of (2) would be the law that proportionals alternate. Alternation used to be

demonstrated separately of numbers, lines, solids, and durations, though it could have been proved of them all by a single demonstration. Because there was no single name to denote that in which numbers, lengths, durations, and solids are identical, and because they differed specifically from one another, this property was proved of each of them separately. To-day, however, the proof is commensurately universal, for they do not possess this attribute qua lines or qua numbers, but qua manifesting this generic character which they are postulated as possessing universally. Hence, even if one prove of each kind of triangle that its angles are equal to two right angles, whether by means of the same or different proofs; still, as long as one treats separately equilateral, scalene, and isosceles, one does not yet know, except sophistically, that triangle has its angles equal to two right angles, nor does one yet know that triangle has this property commensurately and universally, even if there is no other species of triangle but these. For one does not know that triangle as such has this property, nor even that 'all' triangles have it – unless 'all' means 'each taken singly': if 'all' means 'as a whole class', then, though there be none in which one does not recognize this property, one does not know it of 'all triangles'.

When, then, does our knowledge fail of commensurate universality, and when it is unqualified knowledge? If triangle be identical in essence with equilateral, i.e. with each or all equilaterals, then clearly we have unqualified knowledge: if on the other hand it be not, and the attribute belongs to equilateral qua triangle; then our knowledge fails of commensurate universality. 'But', it will be asked, 'does this attribute belong to the subject of which it has been demonstrated qua triangle or qua isosceles? What is the point at which the subject. to which it belongs is primary? (i.e. to what subject can it be demonstrated as belonging commensurately and universally?)' Clearly this point is the first term in which it is found to inhere

as the elimination of inferior differentiae proceeds. Thus the angles of a brazen isosceles triangle are equal to two right angles: but eliminate brazen and isosceles and the attribute remains. ‘But’ – you may say – ’eliminate figure or limit, and the attribute vanishes.’ True, but figure and limit are not the first differentiae whose elimination destroys the attribute. ‘Then what is the first?’ If it is triangle, it will be in virtue of triangle that the attribute belongs to all the other subjects of which it is predicable, and triangle is the subject to which it can be demonstrated as belonging commensurately and universally.

6

Demonstrative knowledge must rest on necessary basic truths; for the object of scientific knowledge cannot be other than it is. Now attributes attaching essentially to their subjects attach necessarily to them: for essential attributes are either elements in the essential nature of their subjects, or contain their subjects as elements in their own essential nature. (The pairs of opposites which the latter class includes are necessary because one member or the other necessarily inheres.) It follows from this that premisses of the demonstrative syllogism must be connexions essential in the sense explained: for all attributes must inhere essentially or else be accidental, and accidental attributes are not necessary to their subjects.

We must either state the case thus, or else premise that the conclusion of demonstration is necessary and that a demonstrated conclusion cannot be other than it is, and then infer that the conclusion must be developed from necessary premisses. For though you may reason from true premisses without demonstrating, yet if your premisses are necessary you

will assuredly demonstrate – in such necessity you have at once a distinctive character of demonstration. That demonstration proceeds from necessary premisses is also indicated by the fact that the objection we raise against a professed demonstration is that a premiss of it is not a necessary truth – whether we think it altogether devoid of necessity, or at any rate so far as our opponent's previous argument goes. This shows how naive it is to suppose one's basic truths rightly chosen if one starts with a proposition which is (1) popularly accepted and (2) true, such as the sophists' assumption that to know is the same as to possess knowledge. For (1) popular acceptance or rejection is no criterion of a basic truth, which can only be the primary law of the genus constituting the subject matter of the demonstration; and (2) not all truth is 'appropriate'.

A further proof that the conclusion must be the development of necessary premisses is as follows. Where demonstration is possible, one who can give no account which includes the cause has no scientific knowledge. If, then, we suppose a syllogism in which, though A necessarily inheres in C, yet B, the middle term of the demonstration, is not necessarily connected with A and C, then the man who argues thus has no reasoned knowledge of the conclusion, since this conclusion does not owe its necessity to the middle term; for though the conclusion is necessary, the mediating link is a contingent fact. Or again, if a man is without knowledge now, though he still retains the steps of the argument, though there is no change in himself or in the fact and no lapse of memory on his part; then neither had he knowledge previously. But the mediating link, not being necessary, may have perished in the interval; and if so, though there be no change in him nor in the fact, and though he will still retain the steps of the argument, yet he has not knowledge, and therefore had not knowledge before. Even if the link has not actually perished but is liable to perish, this situation is possible and might occur. But such a condition cannot be knowledge.

When the conclusion is necessary, the middle through which it was proved may yet quite easily be non-necessary. You can in fact infer the necessary even from a non-necessary premiss, just as you can infer the true from the not true. On the other hand, when the middle is necessary the conclusion must be necessary; just as true premisses always give a true conclusion. Thus, if A is necessarily predicated of B and B of C, then A is necessarily predicated of C. But when the conclusion is nonnecessary the middle cannot be necessary either. Thus: let A be predicated non-necessarily of C but necessarily of B, and let B be a necessary predicate of C; then A too will be a necessary predicate of C, which by hypothesis it is not.

To sum up, then: demonstrative knowledge must be knowledge of a necessary nexus, and therefore must clearly be obtained through a necessary middle term; otherwise its possessor will know neither the cause nor the fact that his conclusion is a necessary connexion. Either he will mistake the non-necessary for the necessary and believe the necessity of the conclusion without knowing it, or else he will not even believe it – in which case he will be equally ignorant, whether he actually infers the mere fact through middle terms or the reasoned fact and from immediate premisses.

Of accidents that are not essential according to our definition of essential there is no demonstrative knowledge; for since an accident, in the sense in which I here speak of it, may also not inhere, it is impossible to prove its inherence as a necessary conclusion. A difficulty, however, might be raised as to why in dialectic, if the conclusion is not a necessary connexion, such and such determinate premisses should be proposed in order to deal with such and such determinate problems. Would not the result be the same if one asked any questions whatever and then merely stated one's conclusion? The solution is that determinate questions have to be put, not because the replies to

them affirm facts which necessitate facts affirmed by the conclusion, but because these answers are propositions which if the answerer affirm, he must affirm the conclusion and affirm it with truth if they are true.

Since it is just those attributes within every genus which are essential and possessed by their respective subjects as such that are necessary it is clear that both the conclusions and the premisses of demonstrations which produce scientific knowledge are essential. For accidents are not necessary: and, further, since accidents are not necessary one does not necessarily have reasoned knowledge of a conclusion drawn from them (this is so even if the accidental premisses are invariable but not essential, as in proofs through signs; for though the conclusion be actually essential, one will not know it as essential nor know its reason); but to have reasoned knowledge of a conclusion is to know it through its cause. We may conclude that the middle must be consequentially connected with the minor, and the major with the middle.

7

It follows that we cannot in demonstrating pass from one genus to another. We cannot, for instance, prove geometrical truths by arithmetic. For there are three elements in demonstration: (1) what is proved, the conclusion – an attribute inhering essentially in a genus; (2) the axioms, i.e. axioms which are premisses of demonstration; (3) the subject – genus whose attributes, i.e. essential properties, are revealed by the demonstration. The axioms which are premisses of demonstration may be identical in two or more sciences: but in the case of two different genera such as arithmetic and

geometry you cannot apply arithmetical demonstration to the properties of magnitudes unless the magnitudes in question are numbers. How in certain cases transference is possible I will explain later.

Arithmetical demonstration and the other sciences likewise possess, each of them, their own genera; so that if the demonstration is to pass from one sphere to another, the genus must be either absolutely or to some extent the same. If this is not so, transference is clearly impossible, because the extreme and the middle terms must be drawn from the same genus: otherwise, as predicated, they will not be essential and will thus be accidents. That is why it cannot be proved by geometry that opposites fall under one science, nor even that the product of two cubes is a cube. Nor can the theorem of any one science be demonstrated by means of another science, unless these theorems are related as subordinate to superior (e.g. as optical theorems to geometry or harmonic theorems to arithmetic). Geometry again cannot prove of lines any property which they do not possess qua lines, i.e. in virtue of the fundamental truths of their peculiar genus: it cannot show, for example, that the straight line is the most beautiful of lines or the contrary of the circle; for these qualities do not belong to lines in virtue of their peculiar genus, but through some property which it shares with other genera.

8

It is also clear that if the premisses from which the syllogism proceeds are commensurately universal, the conclusion of such i.e. in the unqualified sense – must also be eternal. Therefore no attribute can be demonstrated nor known by strictly scientific

knowledge to inhere in perishable things. The proof can only be accidental, because the attribute's connexion with its perishable subject is not commensurately universal but temporary and special. If such a demonstration is made, one premiss must be perishable and not commensurately universal (perishable because only if it is perishable will the conclusion be perishable; not commensurately universal, because the predicate will be predicable of some instances of the subject and not of others); so that the conclusion can only be that a fact is true at the moment – not commensurately and universally. The same is true of definitions, since a definition is either a primary premiss or a conclusion of a demonstration, or else only differs from a demonstration in the order of its terms. Demonstration and science of merely frequent occurrences – e.g. of eclipse as happening to the moon – are, as such, clearly eternal: whereas so far as they are not eternal they are not fully commensurate. Other subjects too have properties attaching to them in the same way as eclipse attaches to the moon.

9

It is clear that if the conclusion is to show an attribute inhering as such, nothing can be demonstrated except from its 'appropriate' basic truths. Consequently a proof even from true, indemonstrable, and immediate premisses does not constitute knowledge. Such proofs are like Bryson's method of squaring the circle; for they operate by taking as their middle a common character – a character, therefore, which the subject may share with another – and consequently they apply equally to subjects different in kind. They therefore afford knowledge of an attribute only as inhering accidentally, not as belonging to its

subject as such: otherwise they would not have been applicable to another genus.

Our knowledge of any attribute's connexion with a subject is accidental unless we know that connexion through the middle term in virtue of which it inheres, and as an inference from basic premisses essential and 'appropriate' to the subject – unless we know, e.g. the property of possessing angles equal to two right angles as belonging to that subject in which it inheres essentially, and as inferred from basic premisses essential and 'appropriate' to that subject: so that if that middle term also belongs essentially to the minor, the middle must belong to the same kind as the major and minor terms. The only exceptions to this rule are such cases as theorems in harmonics which are demonstrable by arithmetic. Such theorems are proved by the same middle terms as arithmetical properties, but with a qualification – the fact falls under a separate science (for the subject genus is separate), but the reasoned fact concerns the superior science, to which the attributes essentially belong. Thus, even these apparent exceptions show that no attribute is strictly demonstrable except from its 'appropriate' basic truths, which, however, in the case of these sciences have the requisite identity of character.

It is no less evident that the peculiar basic truths of each inhering attribute are indemonstrable; for basic truths from which they might be deduced would be basic truths of all that is, and the science to which they belonged would possess universal sovereignty. This is so because he knows better whose knowledge is deduced from higher causes, for his knowledge is from prior premisses when it derives from causes themselves uncaused: hence, if he knows better than others or best of all, his knowledge would be science in a higher or the highest degree. But, as things are, demonstration is not transferable to another genus, with such exceptions as we have mentioned of

the application of geometrical demonstrations to theorems in mechanics or optics, or of arithmetical demonstrations to those of harmonics.

It is hard to be sure whether one knows or not; for it is hard to be sure whether one's knowledge is based on the basic truths appropriate to each attribute – the differentia of true knowledge. We think we have scientific knowledge if we have reasoned from true and primary premisses. But that is not so: the conclusion must be homogeneous with the basic facts of the science.

10

I call the basic truths of every genus those clements in it the existence of which cannot be proved. As regards both these primary truths and the attributes dependent on them the meaning of the name is assumed. The fact of their existence as regards the primary truths must be assumed; but it has to be proved of the remainder, the attributes. Thus we assume the meaning alike of unity, straight, and triangular; but while as regards unity and magnitude we assume also the fact of their existence, in the case of the remainder proof is required.

Of the basic truths used in the demonstrative sciences some are peculiar to each science, and some are common, but common only in the sense of analogous, being of use only in so far as they fall within the genus constituting the province of the science in question.

Peculiar truths are, e.g. the definitions of line and straight; common truths are such as 'take equals from equals and equals remain'. Only so much of these common truths is required as

falls within the genus in question: for a truth of this kind will have the same force even if not used generally but applied by the geometer only to magnitudes, or by the arithmetician only to numbers. Also peculiar to a science are the subjects the existence as well as the meaning of which it assumes, and the essential attributes of which it investigates, e.g. in arithmetic units, in geometry points and lines. Both the existence and the meaning of the subjects are assumed by these sciences; but of their essential attributes only the meaning is assumed. For example arithmetic assumes the meaning of odd and even, square and cube, geometry that of incommensurable, or of deflection or verging of lines, whereas the existence of these attributes is demonstrated by means of the axioms and from previous conclusions as premisses. Astronomy too proceeds in the same way. For indeed every demonstrative science has three elements: (1) that which it posits, the subject genus whose essential attributes it examines; (2) the so-called axioms, which are primary premisses of its demonstration; (3) the attributes, the meaning of which it assumes. Yet some sciences may very well pass over some of these elements; e.g. we might not expressly posit the existence of the genus if its existence were obvious (for instance, the existence of hot and cold is more evident than that of number); or we might omit to assume expressly the meaning of the attributes if it were well understood. In the way the meaning of axioms, such as 'Take equals from equals and equals remain', is well known and so not expressly assumed. Nevertheless in the nature of the case the essential elements of demonstration are three: the subject, the attributes, and the basic premisses.

That which expresses necessary self-grounded fact, and which we must necessarily believe, is distinct both from the hypotheses of a science and from illegitimate postulate – I say 'must believe', because all syllogism, and therefore a fortiori demonstration, is addressed not to the spoken word, but to the

discourse within the soul, and though we can always raise objections to the spoken word, to the inward discourse we cannot always object. That which is capable of proof but assumed by the teacher without proof is, if the pupil believes and accepts it, hypothesis, though only in a limited sense hypothesis – that is, relatively to the pupil; if the pupil has no opinion or a contrary opinion on the matter, the same assumption is an illegitimate postulate. Therein lies the distinction between hypothesis and illegitimate postulate: the latter is the contrary of the pupil's opinion, demonstrable, but assumed and used without demonstration.

The definition – viz. those which are not expressed as statements that anything is or is not – are not hypotheses: but it is in the premisses of a science that its hypotheses are contained. Definitions require only to be understood, and this is not hypothesis – unless it be contended that the pupil's hearing is also an hypothesis required by the teacher. Hypotheses, on the contrary, postulate facts on the being of which depends the being of the fact inferred. Nor are the geometer's hypotheses false, as some have held, urging that one must not employ falsehood and that the geometer is uttering falsehood in stating that the line which he draws is a foot long or straight, when it is actually neither. The truth is that the geometer does not draw any conclusion from the being of the particular line of which he speaks, but from what his diagrams symbolize. A further distinction is that all hypotheses and illegitimate postulates are either universal or particular, whereas a definition is neither.

11

So demonstration does not necessarily imply the being of Forms nor a One beside a Many, but it does necessarily imply the possibility of truly predicating one of many; since without this possibility we cannot save the universal, and if the universal goes, the middle term goes witb. it, and so demonstration becomes impossible. We conclude, then, that there must be a single identical term unequivocally predicable of a number of individuals.

The law that it is impossible to affirm and deny simultaneously the same predicate of the same subject is not expressly posited by any demonstration except when the conclusion also has to be expressed in that form; in which case the proof lays down as its major premiss that the major is truly affirmed of the middle but falsely denied. It makes no difference, however, if we add to the middle, or again to the minor term, the corresponding negative. For grant a minor term of which it is true to predicate man – even if it be also true to predicate not-man of it – still grant simply that man is animal and not not-animal, and the conclusion follows: for it will still be true to say that Callias – even if it be also true to say that not-Callias – is animal and not not-animal. The reason is that the major term is predicable not only of the middle, but of something other than the middle as well, being of wider application; so that the conclusion is not affected even if the middle is extended to cover the original middle term and also what is not the original middle term.

The law that every predicate can be either truly affirmed or truly denied of every subject is posited by such demonstration as uses reductio ad impossibile, and then not always universally, but so far as it is requisite; within the limits, that is, of the genus – the genus, I mean (as I have already explained), to which the man of science applies his demonstrations. In virtue

of the common elements of demonstration – I mean the common axioms which are used as premisses of demonstration, not the subjects nor the attributes demonstrated as belonging to them – all the sciences have communion with one another, and in communion with them all is dialectic and any science which might attempt a universal proof of axioms such as the law of excluded middle, the law that the subtraction of equals from equals leaves equal remainders, or other axioms of the same kind. Dialectic has no definite sphere of this kind, not being confined to a single genus. Otherwise its method would not be interrogative; for the interrogative method is barred to the demonstrator, who cannot use the opposite facts to prove the same nexus. This was shown in my work on the syllogism.

12

If a syllogistic question is equivalent to a proposition embodying one of the two sides of a contradiction, and if each science has its peculiar propositions from which its peculiar conclusion is developed, then there is such a thing as a distinctively scientific question, and it is the interrogative form of the premisses from which the 'appropriate' conclusion of each science is developed. Hence it is clear that not every question will be relevant to geometry, nor to medicine, nor to any other science: only those questions will be geometrical which form premisses for the proof of the theorems of geometry or of any other science, such as optics, which uses the same basic truths as geometry. Of the other sciences the like is true. Of these questions the geometer is bound to give his account, using the basic truths of geometry in conjunction with his previous conclusions; of the basic truths the geometer, as

such, is not bound to give any account. The like is true of the other sciences. There is a limit, then, to the questions which we may put to each man of science; nor is each man of science bound to answer all inquiries on each several subject, but only such as fall within the defined field of his own science. If, then, in controversy with a geometer qua geometer the disputant confines himself to geometry and proves anything from geometrical premisses, he is clearly to be applauded; if he goes outside these he will be at fault, and obviously cannot even refute the geometer except accidentally. One should therefore not discuss geometry among those who are not geometers, for in such a company an unsound argument will pass unnoticed. This is correspondingly true in the other sciences.

Since there are 'geometrical' questions, does it follow that there are also distinctively 'ungeometrical' questions? Further, in each special science – geometry for instance – what kind of error is it that may vitiate questions, and yet not exclude them from that science? Again, is the erroneous conclusion one constructed from premisses opposite to the true premisses, or is it formal fallacy though drawn from geometrical premisses? Or, perhaps, the erroneous conclusion is due to the drawing of premisses from another science; e.g. in a geometrical controversy a musical question is distinctively ungeometrical, whereas the notion that parallels meet is in one sense geometrical, being ungeometrical in a different fashion: the reason being that 'ungeometrical', like 'unrhythmical', is equivocal, meaning in the one case not geometry at all, in the other bad geometry? It is this error, i.e. error based on premisses of this kind – 'of' the science but false – that is the contrary of science. In mathematics the formal fallacy is not so common, because it is the middle term in which the ambiguity lies, since the major is predicated of the whole of the middle and the middle of the whole of the minor (the predicate of course never has the prefix 'all'); and in mathematics one can, so to speak, see these middle

terms with an intellectual vision, while in dialectic the ambiguity may escape detection. E.g. 'Is every circle a figure?' A diagram shows that this is so, but the minor premiss 'Are epics circles?' is shown by the diagram to be false.

If a proof has an inductive minor premiss, one should not bring an 'objection' against it. For since every premiss must be applicable to a number of cases (otherwise it will not be true in every instance, which, since the syllogism proceeds from universals, it must be), then assuredly the same is true of an 'objection'; since premisses and 'objections' are so far the same that anything which can be validly advanced as an 'objection' must be such that it could take the form of a premiss, either demonstrative or dialectical. On the other hand, arguments formally illogical do sometimes occur through taking as middles mere attributes of the major and minor terms. An instance of this is Caeneus' proof that fire increases in geometrical proportion: 'Fire', he argues, 'increases rapidly, and so does geometrical proportion'. There is no syllogism so, but there is a syllogism if the most rapidly increasing proportion is geometrical and the most rapidly increasing proportion is attributable to fire in its motion. Sometimes, no doubt, it is impossible to reason from premisses predicating mere attributes: but sometimes it is possible, though the possibility is overlooked. If false premisses could never give true conclusions 'resolution' would be easy, for premisses and conclusion would in that case inevitably reciprocate. I might then argue thus: let A be an existing fact; let the existence of A imply such and such facts actually known to me to exist, which we may call B. I can now, since they reciprocate, infer A from B.

Reciprocation of premisses and conclusion is more frequent in mathematics, because mathematics takes definitions, but never an accident, for its premisses – a second characteristic

distinguishing mathematical reasoning from dialectical disputations.

A science expands not by the interposition of fresh middle terms, but by the apposition of fresh extreme terms. E.g. A is predicated of B, B of C, C of D, and so indefinitely. Or the expansion may be lateral: e.g. one major A, may be proved of two minors, C and E. Thus let A represent number – a number or number taken indeterminately; B determinate odd number; C any particular odd number. We can then predicate A of C. Next let D represent determinate even number, and E even number. Then A is predicable of E.

13

Knowledge of the fact differs from knowledge of the reasoned fact. To begin with, they differ within the same science and in two ways: (1) when the premisses of the syllogism are not immediate (for then the proximate cause is not contained in them – a necessary condition of knowledge of the reasoned fact): (2) when the premisses are immediate, but instead of the cause the better known of the two reciprocals is taken as the middle; for of two reciprocally predicable terms the one which is not the cause may quite easily be the better known and so become the middle term of the demonstration. Thus (2) (a) you might prove as follows that the planets are near because they do not twinkle: let C be the planets, B not twinkling, A proximity. Then B is predicable of C; for the planets do not twinkle. But A is also predicable of B, since that which does not twinkle is near – we must take this truth as having been reached by induction or sense-perception. Therefore A is a necessary predicate of C; so that we have demonstrated that the

planets are near. This syllogism, then, proves not the reasoned fact but only the fact; since they are not near because they do not twinkle, but, because they are near, do not twinkle. The major and middle of the proof, however, may be reversed, and then the demonstration will be of the reasoned fact. Thus: let C be the planets, B proximity, A not twinkling. Then B is an attribute of C, and A – not twinkling – of B. Consequently A is predicable of C, and the syllogism proves the reasoned fact, since its middle term is the proximate cause. Another example is the inference that the moon is spherical from its manner of waxing. Thus: since that which so waxes is spherical, and since the moon so waxes, clearly the moon is spherical. Put in this form, the syllogism turns out to be proof of the fact, but if the middle and major be reversed it is proof of the reasoned fact; since the moon is not spherical because it waxes in a certain manner, but waxes in such a manner because it is spherical. (Let C be the moon, B spherical, and A waxing.) Again (b), in cases where the cause and the effect are not reciprocal and the effect is the better known, the fact is demonstrated but not the reasoned fact. This also occurs (1) when the middle falls outside the major and minor, for here too the strict cause is not given, and so the demonstration is of the fact, not of the reasoned fact. For example, the question 'Why does not a wall breathe?' might be answered, 'Because it is not an animal'; but that answer would not give the strict cause, because if not being an animal causes the absence of respiration, then being an animal should be the cause of respiration, according to the rule that if the negation of causes the non-inherence of y, the affirmation of x causes the inherence of y; e.g. if the disproportion of the hot and cold elements is the cause of ill health, their proportion is the cause of health; and conversely, if the assertion of x causes the inherence of y, the negation of x must cause y's non-inherence. But in the case given this consequence does not result; for not every animal breathes. A syllogism with this kind

of cause takes place in the second figure. Thus: let A be animal, B respiration, C wall. Then A is predicable of all B (for all that breathes is animal), but of no C; and consequently B is predicable of no C; that is, the wall does not breathe. Such causes are like far-fetched explanations, which precisely consist in making the cause too remote, as in Anacharsis' account of why the Scythians have no flute-players; namely because they have no vines.

Thus, then, do the syllogism of the fact and the syllogism of the reasoned fact differ within one science and according to the position of the middle terms. But there is another way too in which the fact and the reasoned fact differ, and that is when they are investigated respectively by different sciences. This occurs in the case of problems related to one another as subordinate and superior, as when optical problems are subordinated to geometry, mechanical problems to stereometry, harmonic problems to arithmetic, the data of observation to astronomy. (Some of these sciences bear almost the same name; e.g. mathematical and nautical astronomy, mathematical and acoustical harmonics.) Here it is the business of the empirical observers to know the fact, of the mathematicians to know the reasoned fact; for the latter are in possession of the demonstrations giving the causes, and are often ignorant of the fact: just as we have often a clear insight into a universal, but through lack of observation are ignorant of some of its particular instances. These connexions have a perceptible existence though they are manifestations of forms. For the mathematical sciences concern forms: they do not demonstrate properties of a substratum, since, even though the geometrical subjects are predicable as properties of a perceptible substratum, it is not as thus predicable that the mathematician demonstrates properties of them. As optics is related to geometry, so another science is related to optics, namely the theory of the rainbow. Here knowledge of the fact is within the

province of the natural philosopher, knowledge of the reasoned fact within that of the optician, either qua optician or qua mathematical optician. Many sciences not standing in this mutual relation enter into it at points; e.g. medicine and geometry: it is the physician's business to know that circular wounds heal more slowly, the geometer's to know the reason why.

14

Of all the figures the most scientific is the first. Thus, it is the vehicle of the demonstrations of all the mathematical sciences, such as arithmetic, geometry, and optics, and practically all of all sciences that investigate causes: for the syllogism of the reasoned fact is either exclusively or generally speaking and in most cases in this figure – a second proof that this figure is the most scientific; for grasp of a reasoned conclusion is the primary condition of knowledge. Thirdly, the first is the only figure which enables us to pursue knowledge of the essence of a thing. In the second figure no affirmative conclusion is possible, and knowledge of a thing's essence must be affirmative; while in the third figure the conclusion can be affirmative, but cannot be universal, and essence must have a universal character: e.g. man is not two-footed animal in any qualified sense, but universally. Finally, the first figure has no need of the others, while it is by means of the first that the other two figures are developed, and have their intervals closepacked until immediate premisses are reached.

Clearly, therefore, the first figure is the primary condition of knowledge.

15

Just as an attribute A may (as we saw) be atomically connected with a subject B, so its disconnexion may be atomic. I call 'atomic' connexions or disconnexions which involve no intermediate term; since in that case the connexion or disconnexion will not be mediated by something other than the terms themselves. It follows that if either A or B, or both A and B, have a genus, their disconnexion cannot be primary. Thus: let C be the genus of A. Then, if C is not the genus of B – for A may well have a genus which is not the genus of B – there will be a syllogism proving A's disconnexion from B thus:

all A is C,

no B is C,

therefore no B is A.

Or if it is B which has a genus D, we have

all B is D,

no D is A,

therefore no B is A, by syllogism;

and the proof will be similar if both A and B have a genus. That the genus of A need not be the genus of B and vice versa, is shown by the existence of mutually exclusive coordinate series of predication. If no term in the series ACD... is predicable of any term in the series BEF..., and if G – a term in the former series – is the genus of A, clearly G will not be the genus of B; since, if it were, the series would not be mutually exclusive. So also if B has a genus, it will not be the genus of A. If, on the other hand, neither A nor B has a genus and A does not inhere in B, this

disconnexion must be atomic. If there be a middle term, one or other of them is bound to have a genus, for the syllogism will be either in the first or the second figure. If it is in the first, B will have a genus – for the premiss containing it must be affirmative: if in the second, either A or B indifferently, since syllogism is possible if either is contained in a negative premiss, but not if both premisses are negative.

Hence it is clear that one thing may be atomically disconnected from another, and we have stated when and how this is possible.

16

Ignorance – defined not as the negation of knowledge but as a positive state of mind – is error produced by inference.

(1) Let us first consider propositions asserting a predicate's immediate connexion with or disconnexion from a subject. Here, it is true, positive error may befall one in alternative ways; for it may arise where one directly believes a connexion or disconnexion as well as where one's belief is acquired by inference. The error, however, that consists in a direct belief is without complication; but the error resulting from inference – which here concerns us – takes many forms. Thus, let A be atomically disconnected from all B: then the conclusion inferred through a middle term C, that all B is A, will be a case of error produced by syllogism. Now, two cases are possible. Either (a) both premisses, or (b) one premiss only, may be false. (a) If neither A is an attribute of any C nor C of any B, whereas the contrary was posited in both cases, both premisses will be false. (C may quite well be so related to A and B that C is neither subordinate to A nor a universal attribute of B: for B, since A was

said to be primarily disconnected from B, cannot have a genus, and A need not necessarily be a universal attribute of all things. Consequently both premisses may be false.) On the other hand, (b) one of the premisses may be true, though not either indifferently but only the major A-C since, B having no genus, the premiss C-B will always be false, while A-C may be true. This is the case if, for example, A is related atomically to both C and B; because when the same term is related atomically to more terms than one, neither of those terms will belong to the other. It is, of course, equally the case if A-C is not atomic.

Error of attribution, then, occurs through these causes and in this form only – for we found that no syllogism of universal attribution was possible in any figure but the first. On the other hand, an error of non-attribution may occur either in the first or in the second figure. Let us therefore first explain the various forms it takes in the first figure and the character of the premisses in each case.

(c) It may occur when both premisses are false; e.g. supposing A atomically connected with both C and B, if it be then assumed that no C is and all B is C, both premisses are false.

(d) It is also possible when one is false. This may be either premiss indifferently. A-C may be true, C-B false – A-C true because A is not an attribute of all things, C-B false because C, which never has the attribute A, cannot be an attribute of B; for if C-B were true, the premiss A-C would no longer be true, and besides if both premisses were true, the conclusion would be true. Or again, C-B may be true and A-C false; e.g. if both C and A contain B as genera, one of them must be subordinate to the other, so that if the premiss takes the form No C is A, it will be false. This makes it clear that whether either or both premisses are false, the conclusion will equally be false.

In the second figure the premisses cannot both be wholly false; for if all B is A, no middle term can be with truth universally affirmed of one extreme and universally denied of the other: but premisses in which the middle is affirmed of one extreme and denied of the other are the necessary condition if one is to get a valid inference at all. Therefore if, taken in this way, they are wholly false, their contraries conversely should be wholly true. But this is impossible. On the other hand, there is nothing to prevent both premisses being partially false; e.g. if actually some A is C and some B is C, then if it is premised that all A is C and no B is C, both premisses are false, yet partially, not wholly, false. The same is true if the major is made negative instead of the minor. Or one premiss may be wholly false, and it may be either of them. Thus, supposing that actually an attribute of all A must also be an attribute of all B, then if C is yet taken to be a universal attribute of all but universally non-attributable to B, C-A will be true but C-B false. Again, actually that which is an attribute of no B will not be an attribute of all A either; for if it be an attribute of all A, it will also be an attribute of all B, which is contrary to supposition; but if C be nevertheless assumed to be a universal attribute of A, but an attribute of no B, then the premiss C-B is true but the major is false. The case is similar if the major is made the negative premiss. For in fact what is an attribute of no A will not be an attribute of any B either; and if it be yet assumed that C is universally non-attributable to A, but a universal attribute of B, the premiss C-A is true but the minor wholly false. Again, in fact it is false to assume that that which is an attribute of all B is an attribute of no A, for if it be an attribute of all B, it must be an attribute of some A. If then C is nevertheless assumed to be an attribute of all B but of no A, C-B will be true but C-A false.

It is thus clear that in the case of atomic propositions erroneous inference will be possible not only when both premisses are false but also when only one is false.

17

In the case of attributes not atomically connected with or disconnected from their subjects, (a) (i) as long as the false conclusion is inferred through the 'appropriate' middle, only the major and not both premisses can be false. By 'appropriate middle' I mean the middle term through which the contradictory – i.e. the true-conclusion is inferrible. Thus, let A be attributable to B through a middle term C: then, since to produce a conclusion the premiss C-B must be taken affirmatively, it is clear that this premiss must always be true, for its quality is not changed. But the major A-C is false, for it is by a change in the quality of A-C that the conclusion becomes its contradictory – i.e. true. Similarly (ii) if the middle is taken from another series of predication; e.g. suppose D to be not only contained within A as a part within its whole but also predicable of all B. Then the premiss D-B must remain unchanged, but the quality of A-D must be changed; so that D-B is always true, A-D always false. Such error is practically identical with that which is inferred through the 'appropriate' middle. On the other hand, (b) if the conclusion is not inferred through the 'appropriate' middle – (i) when the middle is subordinate to A but is predicable of no B, both premisses must be false, because if there is to be a conclusion both must be posited as asserting the contrary of what is actually the fact, and so posited both become false: e.g. suppose that actually all D is A but no B is D; then if these premisses are changed in quality, a conclusion will follow and both of the new premisses will be false. When, however, (ii) the middle D is not subordinate to A, A-D will be true, D-B false – A-D true because A was not subordinate to D, D-B false because if it had been true, the

conclusion too would have been true; but it is ex hypothesi false.

When the erroneous inference is in the second figure, both premisses cannot be entirely false; since if B is subordinate to A, there can be no middle predicable of all of one extreme and of none of the other, as was stated before. One premiss, however, may be false, and it may be either of them. Thus, if C is actually an attribute of both A and B, but is assumed to be an attribute of A only and not of B, C-A will be true, C-B false: or again if C be assumed to be attributable to B but to no A, C-B will be true, C-A false.

We have stated when and through what kinds of premisses error will result in cases where the erroneous conclusion is negative. If the conclusion is affirmative, (a) (i) it may be inferred through the 'appropriate' middle term. In this case both premisses cannot be false since, as we said before, C-B must remain unchanged if there is to be a conclusion, and consequently A-C, the quality of which is changed, will always be false. This is equally true if (ii) the middle is taken from another series of predication, as was stated to be the case also with regard to negative error; for D-B must remain unchanged, while the quality of A-D must be converted, and the type of error is the same as before.

(b) The middle may be inappropriate. Then (i) if D is subordinate to A, A-D will be true, but D-B false; since A may quite well be predicable of several terms no one of which can be subordinated to another. If, however, (ii) D is not subordinate to A, obviously A-D, since it is affirmed, will always be false, while D-B may be either true or false; for A may very well be an attribute of no D, whereas all B is D, e.g. no science is animal, all music is science. Equally well A may be an attribute of no D, and D of no B. It emerges, then, that if the middle term is not

subordinate to the major, not only both premisses but either singly may be false.

Thus we have made it clear how many varieties of erroneous inference are liable to happen and through what kinds of premisses they occur, in the case both of immediate and of demonstrable truths.

18

It is also clear that the loss of any one of the senses entails the loss of a corresponding portion of knowledge, and that, since we learn either by induction or by demonstration, this knowledge cannot be acquired. Thus demonstration develops from universals, induction from particulars; but since it is possible to familiarize the pupil with even the so-called mathematical abstractions only through induction – i.e. only because each subject genus possesses, in virtue of a determinate mathematical character, certain properties which can be treated as separate even though they do not exist in isolation – it is consequently impossible to come to grasp universals except through induction. But induction is impossible for those who have not sense-perception. For it is sense-perception alone which is adequate for grasping the particulars: they cannot be objects of scientific knowledge, because neither can universals give us knowledge of them without induction, nor can we get it through induction without sense-perception.

19

Every syllogism is effected by means of three terms. One kind of syllogism serves to prove that A inheres in C by showing that A inheres in B and B in C; the other is negative and one of its premisses asserts one term of another, while the other denies one term of another. It is clear, then, that these are the fundamentals and so-called hypotheses of syllogism. Assume them as they have been stated, and proof is bound to follow – proof that A inheres in C through B, and again that A inheres in B through some other middle term, and similarly that B inheres in C. If our reasoning aims at gaining credence and so is merely dialectical, it is obvious that we have only to see that our inference is based on premisses as credible as possible: so that if a middle term between A and B is credible though not real, one can reason through it and complete a dialectical syllogism. If, however, one is aiming at truth, one must be guided by the real connexions of subjects and attributes. Thus: since there are attributes which are predicated of a subject essentially or naturally and not coincidentally – not, that is, in the sense in which we say 'That white (thing) is a man', which is not the same mode of predication as when we say 'The man is white': the man is white not because he is something else but because he is man, but the white is man because 'being white' coincides with 'humanity' within one substratum – therefore there are terms such as are naturally subjects of predicates. Suppose, then, C such a term not itself attributable to anything else as to a subject, but the proximate subject of the attribute B – i.e. so that B-C is immediate; suppose further E related immediately to F, and F to B. The first question is, must this series terminate, or can it proceed to infinity? The second question is as follows: Suppose nothing is essentially predicated of A, but A is predicated primarily of H and of no intermediate prior term, and suppose H similarly related to G and G to B; then must this series also terminate, or can it too proceed to infinity? There is

this much difference between the questions: the first is, is it possible to start from that which is not itself attributable to anything else but is the subject of attributes, and ascend to infinity? The second is the problem whether one can start from that which is a predicate but not itself a subject of predicates, and descend to infinity? A third question is, if the extreme terms are fixed, can there be an infinity of middles? I mean this: suppose for example that A inheres in C and B is intermediate between them, but between B and A there are other middles, and between these again fresh middles; can these proceed to infinity or can they not? This is the equivalent of inquiring, do demonstrations proceed to infinity, i.e. is everything demonstrable? Or do ultimate subject and primary attribute limit one another?

I hold that the same questions arise with regard to negative conclusions and premisses: viz. if A is attributable to no B, then either this predication will be primary, or there will be an intermediate term prior to B to which a is not attributable – G, let us say, which is attributable to all B – and there may still be another term H prior to G, which is attributable to all G. The same questions arise, I say, because in these cases too either the series of prior terms to which a is not attributable is infinite or it terminates.

One cannot ask the same questions in the case of reciprocating terms, since when subject and predicate are convertible there is neither primary nor ultimate subject, seeing that all the reciprocals qua subjects stand in the same relation to one another, whether we say that the subject has an infinity of attributes or that both subjects and attributes – and we raised the question in both cases – are infinite in number. These questions then cannot be asked – unless, indeed, the terms can reciprocate by two different modes, by accidental predication in one relation and natural predication in the other.

20

Now, it is clear that if the predications terminate in both the upward and the downward direction (by 'upward' I mean the ascent to the more universal, by 'downward' the descent to the more particular), the middle terms cannot be infinite in number. For suppose that A is predicated of F, and that the intermediates – call them B B' B"... – are infinite, then clearly you might descend from and find one term predicated of another ad infinitum, since you have an infinity of terms between you and F; and equally, if you ascend from F, there are infinite terms between you and A. It follows that if these processes are impossible there cannot be an infinity of intermediates between A and F. Nor is it of any effect to urge that some terms of the series AB...F are contiguous so as to exclude intermediates, while others cannot be taken into the argument at all: whichever terms of the series B...I take, the number of intermediates in the direction either of A or of F must be finite or infinite: where the infinite series starts, whether from the first term or from a later one, is of no moment, for the succeeding terms in any case are infinite in number.

21

Further, if in affirmative demonstration the series terminates in both directions, clearly it will terminate too in negative demonstration. Let us assume that we cannot proceed to infinity either by ascending from the ultimate term (by 'ultimate term' I mean a term such as was, not itself attributable to a

subject but itself the subject of attributes), or by descending towards an ultimate from the primary term (by 'primary term' I mean a term predicable of a subject but not itself a subject). If this assumption is justified, the series will also terminate in the case of negation. For a negative conclusion can be proved in all three figures. In the first figure it is proved thus: no B is A, all C is B. In packing the interval B-C we must reach immediate propositions – as is always the case with the minor premiss – since B-C is affirmative. As regards the other premiss it is plain that if the major term is denied of a term D prior to B, D will have to be predicable of all B, and if the major is denied of yet another term prior to D, this term must be predicable of all D. Consequently, since the ascending series is finite, the descent will also terminate and there will be a subject of which A is primarily non-predicable. In the second figure the syllogism is, all A is B, no C is B,..no C is A. If proof of this is required, plainly it may be shown either in the first figure as above, in the second as here, or in the third. The first figure has been discussed, and we will proceed to display the second, proof by which will be as follows: all B is D, no C is D..., since it is required that B should be a subject of which a predicate is affirmed. Next, since D is to be proved not to belong to C, then D has a further predicate which is denied of C. Therefore, since the succession of predicates affirmed of an ever higher universal terminates, the succession of predicates denied terminates too.

The third figure shows it as follows: all B is A, some B is not C. Therefore some A is not C. This premiss, i.e. C-B, will be proved either in the same figure or in one of the two figures discussed above. In the first and second figures the series terminates. If we use the third figure, we shall take as premisses, all E is B, some E is not C, and this premiss again will be proved by a similar prosyllogism. But since it is assumed that the series of descending subjects also terminates, plainly the series of more universal non-predicables will terminate also. Even supposing

that the proof is not confined to one method, but employs them all and is now in the first figure, now in the second or third – even so the regress will terminate, for the methods are finite in number, and if finite things are combined in a finite number of ways, the result must be finite.

Thus it is plain that the regress of middles terminates in the case of negative demonstration, if it does so also in the case of affirmative demonstration. That in fact the regress terminates in both these cases may be made clear by the following dialectical considerations.

22

In the case of predicates constituting the essential nature of a thing, it clearly terminates, seeing that if definition is possible, or in other words, if essential form is knowable, and an infinite series cannot be traversed, predicates constituting a thing's essential nature must be finite in number. But as regards predicates generally we have the following prefatory remarks to make. (1) We can affirm without falsehood 'the white (thing) is walking', and that big (thing) is a log'; or again, 'the log is big', and 'the man walks'. But the affirmation differs in the two cases. When I affirm 'the white is a log', I mean that something which happens to be white is a log – not that white is the substratum in which log inheres, for it was not qua white or qua a species of white that the white (thing) came to be a log, and the white (thing) is consequently not a log except incidentally. On the other hand, when I affirm 'the log is white', I do not mean that something else, which happens also to be a log, is white (as I should if I said 'the musician is white,' which would mean 'the man who happens also to be a musician is white'); on

the contrary, log is here the substratum – the substratum which actually came to be white, and did so qua wood or qua a species of wood and qua nothing else.

If we must lay down a rule, let us entitle the latter kind of statement predication, and the former not predication at all, or not strict but accidental predication. 'White' and 'log' will thus serve as types respectively of predicate and subject.

We shall assume, then, that the predicate is invariably predicated strictly and not accidentally of the subject, for on such predication demonstrations depend for their force. It follows from this that when a single attribute is predicated of a single subject, the predicate must affirm of the subject either some element constituting its essential nature, or that it is in some way qualified, quantified, essentially related, active, passive, placed, or dated.

(2) Predicates which signify substance signify that the subject is identical with the predicate or with a species of the predicate. Predicates not signifying substance which are predicated of a subject not identical with themselves or with a species of themselves are accidental or coincidental; e.g. white is a coincident of man, seeing that man is not identical with white or a species of white, but rather with animal, since man is identical with a species of animal. These predicates which do not signify substance must be predicates of some other subject, and nothing can be white which is not also other than white. The Forms we can dispense with, for they are mere sound without sense; and even if there are such things, they are not relevant to our discussion, since demonstrations are concerned with predicates such as we have defined.

(3) If A is a quality of B, B cannot be a quality of A – a quality of a quality. Therefore A and B cannot be predicated reciprocally of one another in strict predication: they can be affirmed without

falsehood of one another, but not genuinely predicated of each other. For one alternative is that they should be substantially predicated of one another, i.e. B would become the genus or differentia of A – the predicate now become subject. But it has been shown that in these substantial predications neither the ascending predicates nor the descending subjects form an infinite series; e.g. neither the series, man is biped, biped is animal, &c., nor the series predicating animal of man, man of Callias, Callias of a further. subject as an element of its essential nature, is infinite. For all such substance is definable, and an infinite series cannot be traversed in thought: consequently neither the ascent nor the descent is infinite, since a substance whose predicates were infinite would not be definable. Hence they will not be predicated each as the genus of the other; for this would equate a genus with one of its own species. Nor (the other alternative) can a quale be reciprocally predicated of a quale, nor any term belonging to an adjectival category of another such term, except by accidental predication; for all such predicates are coincidents and are predicated of substances. On the other hand – in proof of the impossibility of an infinite ascending series – every predication displays the subject as somehow qualified or quantified or as characterized under one of the other adjectival categories, or else is an element in its substantial nature: these latter are limited in number, and the number of the widest kinds under which predications fall is also limited, for every predication must exhibit its subject as somehow qualified, quantified, essentially related, acting or suffering, or in some place or at some time.

I assume first that predication implies a single subject and a single attribute, and secondly that predicates which are not substantial are not predicated of one another. We assume this because such predicates are all coincidents, and though some are essential coincidents, others of a different type, yet we maintain that all of them alike are predicated of some

substratum and that a coincident is never a substratum – since we do not class as a coincident anything which does not owe its designation to its being something other than itself, but always hold that any coincident is predicated of some substratum other than itself, and that another group of coincidents may have a different substratum. Subject to these assumptions then, neither the ascending nor the descending series of predication in which a single attribute is predicated of a single subject is infinite. For the subjects of which coincidents are predicated are as many as the constitutive elements of each individual substance, and these we have seen are not infinite in number, while in the ascending series are contained those constitutive elements with their coincidents – both of which are finite. We conclude that there is a given subject (D) of which some attribute (C) is primarily predicable; that there must be an attribute (B) primarily predicable of the first attribute, and that the series must end with a term (A) not predicable of any term prior to the last subject of which it was predicated (B), and of which no term prior to it is predicable.

The argument we have given is one of the so-called proofs; an alternative proof follows. Predicates so related to their subjects that there are other predicates prior to them predicable of those subjects are demonstrable; but of demonstrable propositions one cannot have something better than knowledge, nor can one know them without demonstration. Secondly, if a consequent is only known through an antecedent (viz. premisses prior to it) and we neither know this antecedent nor have something better than knowledge of it, then we shall not have scientific knowledge of the consequent. Therefore, if it is possible through demonstration to know anything without qualification and not merely as dependent on the acceptance of certain premisses – i.e. hypothetically – the series of intermediate predications must terminate. If it does not terminate, and beyond any predicate taken as higher than another there remains another still higher,

then every predicate is demonstrable. Consequently, since these demonstrable predicates are infinite in number and therefore cannot be traversed, we shall not know them by demonstration. If, therefore, we have not something better than knowledge of them, we cannot through demonstration have unqualified but only hypothetical science of anything.

As dialectical proofs of our contention these may carry conviction, but an analytic process will show more briefly that neither the ascent nor the descent of predication can be infinite in the demonstrative sciences which are the object of our investigation. Demonstration proves the inherence of essential attributes in things. Now attributes may be essential for two reasons: either because they are elements in the essential nature of their subjects, or because their subjects are elements in their essential nature. An example of the latter is odd as an attribute of number – though it is number's attribute, yet number itself is an element in the definition of odd; of the former, multiplicity or the indivisible, which are elements in the definition of number. In neither kind of attribution can the terms be infinite. They are not infinite where each is related to the term below it as odd is to number, for this would mean the inherence in odd of another attribute of odd in whose nature odd was an essential element: but then number will be an ultimate subject of the whole infinite chain of attributes, and be an element in the definition of each of them. Hence, since an infinity of attributes such as contain their subject in their definition cannot inhere in a single thing, the ascending series is equally finite. Note, moreover, that all such attributes must so inhere in the ultimate subject – e.g. its attributes in number and number in them – as to be commensurate with the subject and not of wider extent. Attributes which are essential elements in the nature of their subjects are equally finite: otherwise definition would be impossible. Hence, if all the attributes predicated are essential and these cannot be infinite, the

ascending series will terminate, and consequently the descending series too.

If this is so, it follows that the intermediates between any two terms are also always limited in number. An immediately obvious consequence of this is that demonstrations necessarily involve basic truths, and that the contention of some – referred to at the outset – that all truths are demonstrable is mistaken. For if there are basic truths, (a) not all truths are demonstrable, and (b) an infinite regress is impossible; since if either (a) or (b) were not a fact, it would mean that no interval was immediate and indivisible, but that all intervals were divisible. This is true because a conclusion is demonstrated by the interposition, not the apposition, of a fresh term. If such interposition could continue to infinity there might be an infinite number of terms between any two terms; but this is impossible if both the ascending and descending series of predication terminate; and of this fact, which before was shown dialectically, analytic proof has now been given.

23

It is an evident corollary of these conclusions that if the same attribute A inheres in two terms C and D predicable either not at all, or not of all instances, of one another, it does not always belong to them in virtue of a common middle term. Isosceles and scalene possess the attribute of having their angles equal to two right angles in virtue of a common middle; for they possess it in so far as they are both a certain kind of figure, and not in so far as they differ from one another. But this is not always the case: for, were it so, if we take B as the common middle in virtue of which A inheres in C and D, clearly B would inhere in C and D

through a second common middle, and this in turn would inhere in C and D through a third, so that between two terms an infinity of intermediates would fall – an impossibility. Thus it need not always be in virtue of a common middle term that a single attribute inheres in several subjects, since there must be immediate intervals. Yet if the attribute to be proved common to two subjects is to be one of their essential attributes, the middle terms involved must be within one subject genus and be derived from the same group of immediate premisses; for we have seen that processes of proof cannot pass from one genus to another.

It is also clear that when A inheres in B, this can be demonstrated if there is a middle term. Further, the 'elements' of such a conclusion are the premisses containing the middle in question, and they are identical in number with the middle terms, seeing that the immediate propositions – or at least such immediate propositions as are universal – are the 'elements'. If, on the other hand, there is no middle term, demonstration ceases to be possible: we are on the way to the basic truths. Similarly if A does not inhere in B, this can be demonstrated if there is a middle term or a term prior to B in which A does not inhere: otherwise there is no demonstration and a basic truth is reached. There are, moreover, as many 'elements' of the demonstrated conclusion as there are middle terms, since it is propositions containing these middle terms that are the basic premisses on which the demonstration rests; and as there are some indemonstrable basic truths asserting that 'this is that' or that 'this inheres in that', so there are others denying that 'this is that' or that 'this inheres in that' – in fact some basic truths will affirm and some will deny being.

When we are to prove a conclusion, we must take a primary essential predicate – suppose it C – of the subject B, and then suppose A similarly predicable of C. If we proceed in this

manner, no proposition or attribute which falls beyond A is admitted in the proof: the interval is constantly condensed until subject and predicate become indivisible, i.e. one. We have our unit when the premiss becomes immediate, since the immediate premiss alone is a single premiss in the unqualified sense of 'single'. And as in other spheres the basic element is simple but not identical in all – in a system of weight it is the mina, in music the quarter-tone, and so on – so in syllogism the unit is an immediate premiss, and in the knowledge that demonstration gives it is an intuition. In syllogisms, then, which prove the inherence of an attribute, nothing falls outside the major term. In the case of negative syllogisms on the other hand, (1) in the first figure nothing falls outside the major term whose inherence is in question; e.g. to prove through a middle C that A does not inhere in B the premisses required are, all B is C, no C is A. Then if it has to be proved that no C is A, a middle must be found between and C; and this procedure will never vary.

(2) If we have to show that E is not D by means of the premisses, all D is C; no E, or not all E, is C; then the middle will never fall beyond E, and E is the subject of which D is to be denied in the conclusion.

(3) In the third figure the middle will never fall beyond the limits of the subject and the attribute denied of it.

24

Since demonstrations may be either commensurately universal or particular, and either affirmative or negative; the question arises, which form is the better? And the same question may be put in regard to so-called 'direct' demonstration and reductio ad

impossibile. Let us first examine the commensurately universal and the particular forms, and when we have cleared up this problem proceed to discuss 'direct' demonstration and reductio ad impossibile.

The following considerations might lead some minds to prefer particular demonstration.

(1) The superior demonstration is the demonstration which gives us greater knowledge (for this is the ideal of demonstration), and we have greater knowledge of a particular individual when we know it in itself than when we know it through something else; e.g. we know Coriscus the musician better when we know that Coriscus is musical than when we know only that man is musical, and a like argument holds in all other cases. But commensurately universal demonstration, instead of proving that the subject itself actually is x, proves only that something else is x – e.g. in attempting to prove that isosceles is x, it proves not that isosceles but only that triangle is x – whereas particular demonstration proves that the subject itself is x. The demonstration, then, that a subject, as such, possesses an attribute is superior. If this is so, and if the particular rather than the commensurately universal forms demonstrates, particular demonstration is superior.

(2) The universal has not a separate being over against groups of singulars. Demonstration nevertheless creates the opinion that its function is conditioned by something like this – some separate entity belonging to the real world; that, for instance, of triangle or of figure or number, over against particular triangles, figures, and numbers. But demonstration which touches the real and will not mislead is superior to that which moves among unrealities and is delusory. Now commensurately universal demonstration is of the latter kind: if we engage in it we find ourselves reasoning after a fashion well illustrated by

the argument that the proportionate is what answers to the definition of some entity which is neither line, number, solid, nor plane, but a proportionate apart from all these. Since, then, such a proof is characteristically commensurate and universal, and less touches reality than does particular demonstration, and creates a false opinion, it will follow that commensurate and universal is inferior to particular demonstration.

We may retort thus. (1) The first argument applies no more to commensurate and universal than to particular demonstration. If equality to two right angles is attributable to its subject not qua isosceles but qua triangle, he who knows that isosceles possesses that attribute knows the subject as qua itself possessing the attribute, to a less degree than he who knows that triangle has that attribute. To sum up the whole matter: if a subject is proved to possess qua triangle an attribute which it does not in fact possess qua triangle, that is not demonstration: but if it does possess it qua triangle the rule applies that the greater knowledge is his who knows the subject as possessing its attribute qua that in virtue of which it actually does possess it. Since, then, triangle is the wider term, and there is one identical definition of triangle – i.e. the term is not equivocal – and since equality to two right angles belongs to all triangles, it is isosceles qua triangle and not triangle qua isosceles which has its angles so related. It follows that he who knows a connexion universally has greater knowledge of it as it in fact is than he who knows the particular; and the inference is that commensurate and universal is superior to particular demonstration.

(2) If there is a single identical definition i.e. if the commensurate universal is unequivocal – then the universal will possess being not less but more than some of the particulars, inasmuch as it is universals which comprise the imperishable, particulars that tend to perish.

(3) Because the universal has a single meaning, we are not therefore compelled to suppose that in these examples it has being as a substance apart from its particulars – any more than we need make a similar supposition in the other cases of unequivocal universal predication, viz. where the predicate signifies not substance but quality, essential relatedness, or action. If such a supposition is entertained, the blame rests not with the demonstration but with the hearer.

(4) Demonstration is syllogism that proves the cause, i.e. the reasoned fact, and it is rather the commensurate universal than the particular which is causative (as may be shown thus: that which possesses an attribute through its own essential nature is itself the cause of the inherence, and the commensurate universal is primary; hence the commensurate universal is the cause). Consequently commensurately universal demonstration is superior as more especially proving the cause, that is the reasoned fact.

(5) Our search for the reason ceases, and we think that we know, when the coming to be or existence of the fact before us is not due to the coming to be or existence of some other fact, for the last step of a search thus conducted is eo ipso the end and limit of the problem. Thus: 'Why did he come?' 'To get the money – wherewith to pay a debt – that he might thereby do what was right.' When in this regress we can no longer find an efficient or final cause, we regard the last step of it as the end of the coming – or being or coming to be – and we regard ourselves as then only having full knowledge of the reason why he came.

If, then, all causes and reasons are alike in this respect, and if this is the means to full knowledge in the case of final causes such as we have exemplified, it follows that in the case of the other causes also full knowledge is attained when an attribute no longer inheres because of something else. Thus, when we

learn that exterior angles are equal to four right angles because they are the exterior angles of an isosceles, there still remains the question ‘Why has isosceles this attribute?’ and its answer ‘Because it is a triangle, and a triangle has it because a triangle is a rectilinear figure.’ If rectilinear figure possesses the property for no further reason, at this point we have full knowledge – but at this point our knowledge has become commensurately universal, and so we conclude that commensurately universal demonstration is superior.

(6) The more demonstration becomes particular the more it sinks into an indeterminate manifold, while universal demonstration tends to the simple and determinate. But objects so far as they are an indeterminate manifold are unintelligible, so far as they are determinate, intelligible: they are therefore intelligible rather in so far as they are universal than in so far as they are particular. From this it follows that universals are more demonstrable: but since relative and correlative increase concomitantly, of the more demonstrable there will be fuller demonstration. Hence the commensurate and universal form, being more truly demonstration, is the superior.

(7) Demonstration which teaches two things is preferable to demonstration which teaches only one. He who possesses commensurately universal demonstration knows the particular as well, but he who possesses particular demonstration does not know the universal. So that this is an additional reason for preferring commensurately universal demonstration. And there is yet this further argument:

(8) Proof becomes more and more proof of the commensurate universal as its middle term approaches nearer to the basic truth, and nothing is so near as the immediate premiss which is itself the basic truth. If, then, proof from the basic truth is more accurate than proof not so derived, demonstration which

depends more closely on it is more accurate than demonstration which is less closely dependent. But commensurately universal demonstration is characterized by this closer dependence, and is therefore superior. Thus, if A had to be proved to inhere in D, and the middles were B and C, B being the higher term would render the demonstration which it mediated the more universal.

Some of these arguments, however, are dialectical. The clearest indication of the precedence of commensurately universal demonstration is as follows: if of two propositions, a prior and a posterior, we have a grasp of the prior, we have a kind of knowledge – a potential grasp – of the posterior as well. For example, if one knows that the angles of all triangles are equal to two right angles, one knows in a sense – potentially – that the isosceles' angles also are equal to two right angles, even if one does not know that the isosceles is a triangle; but to grasp this posterior proposition is by no means to know the commensurate universal either potentially or actually. Moreover, commensurately universal demonstration is through and through intelligible; particular demonstration issues in sense-perception.

25

The preceding arguments constitute our defence of the superiority of commensurately universal to particular demonstration. That affirmative demonstration excels negative may be shown as follows.

(1) We may assume the superiority ceteris paribus of the demonstration which derives from fewer postulates or hypotheses – in short from fewer premisses; for, given that all

these are equally well known, where they are fewer knowledge will be more speedily acquired, and that is a desideratum. The argument implied in our contention that demonstration from fewer assumptions is superior may be set out in universal form as follows. Assuming that in both cases alike the middle terms are known, and that middles which are prior are better known than such as are posterior, we may suppose two demonstrations of the inherence of A in E, the one proving it through the middles B, C and D, the other through F and G. Then A-D is known to the same degree as A-E (in the second proof), but A-D is better known than and prior to A-E (in the first proof); since A-E is proved through A-D, and the ground is more certain than the conclusion.

Hence demonstration by fewer premisses is ceteris paribus superior. Now both affirmative and negative demonstration operate through three terms and two premisses, but whereas the former assumes only that something is, the latter assumes both that something is and that something else is not, and thus operating through more kinds of premiss is inferior.

(2) It has been proved that no conclusion follows if both premisses are negative, but that one must be negative, the other affirmative. So we are compelled to lay down the following additional rule: as the demonstration expands, the affirmative premisses must increase in number, but there cannot be more than one negative premiss in each complete proof. Thus, suppose no B is A, and all C is B. Then if both the premisses are to be again expanded, a middle must be interposed. Let us interpose D between A and B, and E between B and C. Then clearly E is affirmatively related to B and C, while D is affirmatively related to B but negatively to A; for all B is D, but there must be no D which is A. Thus there proves to be a single negative premiss, A-D. In the further prosyllogisms too it is the same, because in the terms of an affirmative syllogism the

middle is always related affirmatively to both extremes; in a negative syllogism it must be negatively related only to one of them, and so this negation comes to be a single negative premiss, the other premisses being affirmative. If, then, that through which a truth is proved is a better known and more certain truth, and if the negative proposition is proved through the affirmative and not vice versa, affirmative demonstration, being prior and better known and more certain, will be superior.

(3) The basic truth of demonstrative syllogism is the universal immediate premiss, and the universal premiss asserts in affirmative demonstration and in negative denies: and the affirmative proposition is prior to and better known than the negative (since affirmation explains denial and is prior to denial, just as being is prior to not-being). It follows that the basic premiss of affirmative demonstration is superior to that of negative demonstration, and the demonstration which uses superior basic premisses is superior.

(4) Affirmative demonstration is more of the nature of a basic form of proof, because it is a sine qua non of negative demonstration.

26

Since affirmative demonstration is superior to negative, it is clearly superior also to reductio ad impossibile. We must first make certain what is the difference between negative demonstration and reductio ad impossibile. Let us suppose that no B is A, and that all C is B: the conclusion necessarily follows that no C is A. If these premisses are assumed, therefore, the negative demonstration that no C is A is direct. Reductio ad impossibile, on the other hand, proceeds as follows. Supposing

we are to prove that does not inhere in B, we have to assume that it does inhere, and further that B inheres in C, with the resulting inference that A inheres in C. This we have to suppose a known and admitted impossibility; and we then infer that A cannot inhere in B. Thus if the inherence of B in C is not questioned, A's inherence in B is impossible.

The order of the terms is the same in both proofs: they differ according to which of the negative propositions is the better known, the one denying A of B or the one denying A of C. When the falsity of the conclusion is the better known, we use reductio ad impossible; when the major premiss of the syllogism is the more obvious, we use direct demonstration. All the same the proposition denying A of B is, in the order of being, prior to that denying A of C; for premisses are prior to the conclusion which follows from them, and 'no C is A' is the conclusion, 'no B is A' one of its premisses. For the destructive result of reductio ad impossibile is not a proper conclusion, nor are its antecedents proper premisses. On the contrary: the constituents of syllogism are premisses related to one another as whole to part or part to whole, whereas the premisses A-C and A-B are not thus related to one another. Now the superior demonstration is that which proceeds from better known and prior premisses, and while both these forms depend for credence on the not-being of something, yet the source of the one is prior to that of the other. Therefore negative demonstration will have an unqualified superiority to reductio ad impossibile, and affirmative demonstration, being superior to negative, will consequently be superior also to reductio ad impossibile.

27

The science which is knowledge at once of the fact and of the reasoned fact, not of the fact by itself without the reasoned fact, is the more exact and the prior science.

A science such as arithmetic, which is not a science of properties qua inhering in a substratum, is more exact than and prior to a science like harmonics, which is a science of pr,operties inhering in a substratum; and similarly a science like arithmetic, which is constituted of fewer basic elements, is more exact than and prior to geometry, which requires additional elements. What I mean by 'additional elements' is this: a unit is substance without position, while a point is substance with position; the latter contains an additional element.

28

A single science is one whose domain is a single genus, viz. all the subjects constituted out of the primary entities of the genus – i.e. the parts of this total subject – and their essential properties.

One science differs from another when their basic truths have neither a common source nor are derived those of the one science from those the other. This is verified when we reach the indemonstrable premisses of a science, for they must be within one genus with its conclusions: and this again is verified if the conclusions proved by means of them fall within one genus – i.e. are homogeneous.

29

One can have several demonstrations of the same connexion not only by taking from the same series of predication middles which are other than the immediately cohering term e.g. by taking C, D, and F severally to prove A-B – but also by taking a middle from another series. Thus let A be change, D alteration of a property, B feeling pleasure, and G relaxation. We can then without falsehood predicate D of B and A of D, for he who is pleased suffers alteration of a property, and that which alters a property changes. Again, we can predicate A of G without falsehood, and G of B; for to feel pleasure is to relax, and to relax is to change. So the conclusion can be drawn through middles which are different, i.e. not in the same series – yet not so that neither of these middles is predicable of the other, for they must both be attributable to some one subject.

A further point worth investigating is how many ways of proving the same conclusion can be obtained by varying the figure.

30

There is no knowledge by demonstration of chance conjunctions; for chance conjunctions exist neither by necessity nor as general connexions but comprise what comes to be as something distinct from these. Now demonstration is concerned only with one or other of these two; for all reasoning proceeds from necessary or general premisses, the conclusion being necessary if the premisses are necessary and general if

the premisses are general. Consequently, if chance conjunctions are neither general nor necessary, they are not demonstrable.

31

Scientific knowledge is not possible through the act of perception. Even if perception as a faculty is of ‘the such’ and not merely of a ‘this somewhat’, yet one must at any rate actually perceive a ‘this somewhat’, and at a definite present place and time: but that which is commensurately universal and true in all cases one cannot perceive, since it is not ‘this’ and it is not ‘now’; if it were, it would not be commensurately universal – the term we apply to what is always and everywhere. Seeing, therefore, that demonstrations are commensurately universal and universals imperceptible, we clearly cannot obtain scientific knowledge by the act of perception: nay, it is obvious that even if it were possible to perceive that a triangle has its angles equal to two right angles, we should still be looking for a demonstration – we should not (as some say) possess knowledge of it; for perception must be of a particular, whereas scientific knowledge involves the recognition of the commensurate universal. So if we were on the moon, and saw the earth shutting out the sun’s light, we should not know the cause of the eclipse: we should perceive the present fact of the eclipse, but not the reasoned fact at all, since the act of perception is not of the commensurate universal. I do not, of course, deny that by watching the frequent recurrence of this event we might, after tracking the commensurate universal, possess a demonstration, for the commensurate universal is elicited from the several groups of singulars.

The commensurate universal is precious because it makes clear the cause; so that in the case of facts like these which have a cause other than themselves universal knowledge is more precious than sense-perceptions and than intuition. (As regards primary truths there is of course a different account to be given.) Hence it is clear that knowledge of things demonstrable cannot be acquired by perception, unless the term perception is applied to the possession of scientific knowledge through demonstration. Nevertheless certain points do arise with regard to connexions to be proved which are referred for their explanation to a failure in sense-perception: there are cases when an act of vision would terminate our inquiry, not because in seeing we should be knowing, but because we should have elicited the universal from seeing; if, for example, we saw the pores in the glass and the light passing through, the reason of the kindling would be clear to us because we should at the same time see it in each instance and intuit that it must be so in all instances.

32

All syllogisms cannot have the same basic truths. This may be shown first of all by the following dialectical considerations. (1) Some syllogisms are true and some false: for though a true inference is possible from false premisses, yet this occurs once only – I mean if A for instance, is truly predicable of C, but B, the middle, is false, both A-B and B-C being false; nevertheless, if middles are taken to prove these premisses, they will be false because every conclusion which is a falsehood has false premisses, while true conclusions have true premisses, and false and true differ in kind. Then again, (2) falsehoods are not all derived from a single identical set of principles: there are

falsehoods which are the contraries of one another and cannot coexist, e.g. 'justice is injustice', and 'justice is cowardice'; 'man is horse', and 'man is ox'; 'the equal is greater', and 'the equal is less.' From established principles we may argue the case as follows, confining ourselves therefore to true conclusions. Not even all these are inferred from the same basic truths; many of them in fact have basic truths which differ generically and are not transferable; units, for instance, which are without position, cannot take the place of points, which have position. The transferred terms could only fit in as middle terms or as major or minor terms, or else have some of the other terms between them, others outside them.

Nor can any of the common axioms – such, I mean, as the law of excluded middle – serve as premisses for the proof of all conclusions. For the kinds of being are different, and some attributes attach to quanta and some to qualia only; and proof is achieved by means of the common axioms taken in conjunction with these several kinds and their attributes.

Again, it is not true that the basic truths are much fewer than the conclusions, for the basic truths are the premisses, and the premisses are formed by the apposition of a fresh extreme term or the interposition of a fresh middle. Moreover, the number of conclusions is indefinite, though the number of middle terms is finite; and lastly some of the basic truths are necessary, others variable.

Looking at it in this way we see that, since the number of conclusions is indefinite, the basic truths cannot be identical or limited in number. If, on the other hand, identity is used in another sense, and it is said, e.g. 'these and no other are the fundamental truths of geometry, these the fundamentals of calculation, these again of medicine'; would the statement mean anything except that the sciences have basic truths? To

call them identical because they are self-identical is absurd, since everything can be identified with everything in that sense of identity. Nor again can the contention that all conclusions have the same basic truths mean that from the mass of all possible premisses any conclusion may be drawn. That would be exceedingly naive, for it is not the case in the clearly evident mathematical sciences, nor is it possible in analysis, since it is the immediate premisses which are the basic truths, and a fresh conclusion is only formed by the addition of a new immediate premiss: but if it be admitted that it is these primary immediate premisses which are basic truths, each subject-genus will provide one basic truth. If, however, it is not argued that from the mass of all possible premisses any conclusion may be proved, nor yet admitted that basic truths differ so as to be generically different for each science, it remains to consider the possibility that, while the basic truths of all knowledge are within one genus, special premisses are required to prove special conclusions. But that this cannot be the case has been shown by our proof that the basic truths of things generically different themselves differ generically. For fundamental truths are of two kinds, those which are premisses of demonstration and the subject-genus; and though the former are common, the latter – number, for instance, and magnitude – are peculiar.

33

Scientific knowledge and its object differ from opinion and the object of opinion in that scientific knowledge is commensurately universal and proceeds by necessary connexions, and that which is necessary cannot be otherwise. So though there are things which are true and real and yet can be otherwise, scientific knowledge clearly does not concern

them: if it did, things which can be otherwise would be incapable of being otherwise. Nor are they any concern of rational intuition – by rational intuition I mean an originative source of scientific knowledge – nor of indemonstrable knowledge, which is the grasping of the immediate premiss. Since then rational intuition, science, and opinion, and what is revealed by these terms, are the only things that can be 'true', it follows that it is opinion that is concerned with that which may be true or false, and can be otherwise: opinion in fact is the grasp of a premiss which is immediate but not necessary. This view also fits the observed facts, for opinion is unstable, and so is the kind of being we have described as its object. Besides, when a man thinks a truth incapable of being otherwise he always thinks that he knows it, never that he opines it. He thinks that he opines when he thinks that a connexion, though actually so, may quite easily be otherwise; for he believes that such is the proper object of opinion, while the necessary is the object of knowledge.

In what sense, then, can the same thing be the object of both opinion and knowledge? And if any one chooses to maintain that all that he knows he can also opine, why should not opinion be knowledge? For he that knows and he that opines will follow the same train of thought through the same middle terms until the immediate premisses are reached; because it is possible to opine not only the fact but also the reasoned fact, and the reason is the middle term; so that, since the former knows, he that opines also has knowledge.

The truth perhaps is that if a man grasp truths that cannot be other than they are, in the way in which he grasps the definitions through which demonstrations take place, he will have not opinion but knowledge: if on the other hand he apprehends these attributes as inhering in their subjects, but not in virtue of the subjects' substance and essential nature

possesses opinion and not genuine knowledge; and his opinion, if obtained through immediate premisses, will be both of the fact and of the reasoned fact; if not so obtained, of the fact alone. The object of opinion and knowledge is not quite identical; it is only in a sense identical, just as the object of true and false opinion is in a sense identical. The sense in which some maintain that true and false opinion can have the same object leads them to embrace many strange doctrines, particularly the doctrine that what a man opines falsely he does not opine at all. There are really many senses of 'identical', and in one sense the object of true and false opinion can be the same, in another it cannot. Thus, to have a true opinion that the diagonal is commensurate with the side would be absurd: but because the diagonal with which they are both concerned is the same, the two opinions have objects so far the same: on the other hand, as regards their essential definable nature these objects differ. The identity of the objects of knowledge and opinion is similar. Knowledge is the apprehension of, e.g. the attribute 'animal' as incapable of being otherwise, opinion the apprehension of 'animal' as capable of being otherwise – e.g. the apprehension that animal is an element in the essential nature of man is knowledge; the apprehension of animal as predicable of man but not as an element in man's essential nature is opinion: man is the subject in both judgements, but the mode of inherence differs.

This also shows that one cannot opine and know the same thing simultaneously; for then one would apprehend the same thing as both capable and incapable of being otherwise – an impossibility. Knowledge and opinion of the same thing can co-exist in two different people in the sense we have explained, but not simultaneously in the same person. That would involve a man's simultaneously apprehending, e.g. (1) that man is essentially animal – i.e. cannot be other than animal – and (2)

that man is not essentially animal, that is, we may assume, may be other than animal.

Further consideration of modes of thinking and their distribution under the heads of discursive thought, intuition, science, art, practical wisdom, and metaphysical thinking, belongs rather partly to natural science, partly to moral philosophy.

34

Quick wit is a faculty of hitting upon the middle term instantaneously. It would be exemplified by a man who saw that the moon has her bright side always turned towards the sun, and quickly grasped the cause of this, namely that she borrows her light from him; or observed somebody in conversation with a man of wealth and divined that he was borrowing money, or that the friendship of these people sprang from a common enmity. In all these instances he has seen the major and minor terms and then grasped the causes, the middle terms.

Let A represent 'bright side turned sunward', B 'lighted from the sun', C the moon. Then B, 'lighted from the sun' is predicable of C, the moon, and A, 'having her bright side towards the source of her light', is predicable of B. So A is predicable of C through B.

Book II

1

The kinds of question we ask are as many as the kinds of things which we know. They are in fact four: – (1) whether the connexion of an attribute with a thing is a fact, (2) what is the reason of the connexion, (3) whether a thing exists, (4) What is the nature of the thing. Thus, when our question concerns a complex of thing and attribute and we ask whether the thing is thus or otherwise qualified – whether, e.g. the sun suffers eclipse or not – then we are asking as to the fact of a connexion. That our inquiry ceases with the discovery that the sun does suffer eclipse is an indication of this; and if we know from the start that the sun suffers eclipse, we do not inquire whether it does so or not. On the other hand, when we know the fact we ask the reason; as, for example, when we know that the sun is being eclipsed and that an earthquake is in progress, it is the reason of eclipse or earthquake into which we inquire.

Where a complex is concerned, then, those are the two questions we ask; but for some objects of inquiry we have a different kind of question to ask, such as whether there is or is not a centaur or a God. (By 'is or is not' I mean 'is or is not, without further qualification'; as opposed to 'is or is not [e.g.] white'.) On the other hand, when we have ascertained the thing's existence, we inquire as to its nature, asking, for instance, 'what, then, is God?' or 'what is man?'.

2

These, then, are the four kinds of question we ask, and it is in the answers to these questions that our knowledge consists.

Now when we ask whether a connexion is a fact, or whether a thing without qualification is, we are really asking whether the connexion or the thing has a 'middle'; and when we have ascertained either that the connexion is a fact or that the thing is – i.e. ascertained either the partial or the unqualified being of the thing-and are proceeding to ask the reason of the connexion or the nature of the thing, then we are asking what the 'middle' is.

(By distinguishing the fact of the connexion and the existence of the thing as respectively the partial and the unqualified being of the thing, I mean that if we ask 'does the moon suffer eclipse?', or 'does the moon wax?', the question concerns a part of the thing's being; for what we are asking in such questions is whether a thing is this or that, i.e. has or has not this or that attribute: whereas, if we ask whether the moon or night exists, the question concerns the unqualified being of a thing.)

We conclude that in all our inquiries we are asking either whether there is a 'middle' or what the 'middle' is: for the 'middle' here is precisely the cause, and it is the cause that we seek in all our inquiries. Thus, 'Does the moon suffer eclipse?' means 'Is there or is there not a cause producing eclipse of the moon?', and when we have learnt that there is, our next question is, 'What, then, is this cause? for the cause through which a thing is – not is this or that, i.e. has this or that attribute, but without qualification is – and the cause through which it is – not is without qualification, but is this or that as having some essential attribute or some accident – are both alike the middle'. By that which is without qualification I mean the subject, e.g. moon or earth or sun or triangle; by that which

a subject is (in the partial sense) I mean a property, e.g. eclipse, equality or inequality, interposition or non-interposition. For in all these examples it is clear that the nature of the thing and the reason of the fact are identical: the question 'What is eclipse?' and its answer 'The privation of the moon's light by the interposition of the earth' are identical with the question 'What is the reason of eclipse?' or 'Why does the moon suffer eclipse?' and the reply 'Because of the failure of light through the earth's shutting it out'. Again, for 'What is a concord? A commensurate numerical ratio of a high and a low note', we may substitute 'What ratio makes a high and a low note concordant? Their relation according to a commensurate numerical ratio.' 'Are the high and the low note concordant?' is equivalent to 'Is their ratio commensurate?'; and when we find that it is commensurate, we ask 'What, then, is their ratio?'.

Cases in which the 'middle' is sensible show that the object of our inquiry is always the 'middle': we inquire, because we have not perceived it, whether there is or is not a 'middle' causing, e.g. an eclipse. On the other hand, if we were on the moon we should not be inquiring either as to the fact or the reason, but both fact and reason would be obvious simultaneously. For the act of perception would have enabled us to know the universal too; since, the present fact of an eclipse being evident, perception would then at the same time give us the present fact of the earth's screening the sun's light, and from this would arise the universal.

Thus, as we maintain, to know a thing's nature is to know the reason why it is; and this is equally true of things in so far as they are said without qualification to he as opposed to being possessed of some attribute, and in so far as they are said to be possessed of some attribute such as equal to right angles, or greater or less.

3

It is clear, then, that all questions are a search for a 'middle'. Let us now state how essential nature is revealed and in what way it can be reduced to demonstration; what definition is, and what things are definable. And let us first discuss certain difficulties which these questions raise, beginning what we have to say with a point most intimately connected with our immediately preceding remarks, namely the doubt that might be felt as to whether or not it is possible to know the same thing in the same relation, both by definition and by demonstration. It might, I mean, be urged that definition is held to concern essential nature and is in every case universal and affirmative; whereas, on the other hand, some conclusions are negative and some are not universal; e.g. all in the second figure are negative, none in the third are universal. And again, not even all affirmative conclusions in the first figure are definable, e.g. 'every triangle has its angles equal to two right angles'. An argument proving this difference between demonstration and definition is that to have scientific knowledge of the demonstrable is identical with possessing a demonstration of it: hence if demonstration of such conclusions as these is possible, there clearly cannot also be definition of them. If there could, one might know such a conclusion also in virtue of its definition without possessing the demonstration of it; for there is nothing to stop our having the one without the other.

Induction too will sufficiently convince us of this difference; for never yet by defining anything – essential attribute or accident – did we get knowledge of it. Again, if to define is to acquire knowledge of a substance, at any rate such attributes are not substances.

It is evident, then, that not everything demonstrable can be defined. What then? Can everything definable be demonstrated, or not? There is one of our previous arguments which covers this too. Of a single thing qua single there is a single scientific knowledge. Hence, since to know the demonstrable scientifically is to possess the demonstration of it, an impossible consequence will follow: – possession of its definition without its demonstration will give knowledge of the demonstrable.

Moreover, the basic premisses of demonstrations are definitions, and it has already been shown that these will be found indemonstrable; either the basic premisses will be demonstrable and will depend on prior premisses, and the regress will be endless; or the primary truths will be indemonstrable definitions.

But if the definable and the demonstrable are not wholly the same, may they yet be partially the same? Or is that impossible, because there can be no demonstration of the definable? There can be none, because definition is of the essential nature or being of something, and all demonstrations evidently posit and assume the essential nature – mathematical demonstrations, for example, the nature of unity and the odd, and all the other sciences likewise. Moreover, every demonstration proves a predicate of a subject as attaching or as not attaching to it, but in definition one thing is not predicated of another; we do not, e.g. predicate animal of biped nor biped of animal, nor yet figure of plane – plane not being figure nor figure plane. Again, to prove essential nature is not the same as to prove the fact of a connexion. Now definition reveals essential nature, demonstration reveals that a given attribute attaches or does not attach to a given subject; but different things require different demonstrations – unless the one demonstration is related to the other as part to whole. I add this because if all

triangles have been proved to possess angles equal to two right angles, then this attribute has been proved to attach to isosceles; for isosceles is a part of which all triangles constitute the whole. But in the case before us the fact and the essential nature are not so related to one another, since the one is not a part of the other.

So it emerges that not all the definable is demonstrable nor all the demonstrable definable; and we may draw the general conclusion that there is no identical object of which it is possible to possess both a definition and a demonstration. It follows obviously that definition and demonstration are neither identical nor contained either within the other: if they were, their objects would be related either as identical or as whole and part.

4

So much, then, for the first stage of our problem. The next step is to raise the question whether syllogism – i.e. demonstration – of the definable nature is possible or, as our recent argument assumed, impossible.

We might argue it impossible on the following grounds: – (a) syllogism proves an attribute of a subject through the middle term; on the other hand (b) its definable nature is both 'peculiar' to a subject and predicated of it as belonging to its essence. But in that case (1) the subject, its definition, and the middle term connecting them must be reciprocally predicable of one another; for if A is to C, obviously A is 'peculiar' to B and B to C – in fact all three terms are 'peculiar' to one another: and further (2) if A inheres in the essence of all B and B is predicated

universally of all C as belonging to C's essence, A also must be predicated of C as belonging to its essence.

If one does not take this relation as thus duplicated – if, that is, A is predicated as being of the essence of B, but B is not of the essence of the subjects of which it is predicated – A will not necessarily be predicated of C as belonging to its essence. So both premisses will predicate essence, and consequently B also will be predicated of C as its essence. Since, therefore, both premisses do predicate essence – i.e. definable form – C's definable form will appear in the middle term before the conclusion is drawn.

We may generalize by supposing that it is possible to prove the essential nature of man. Let C be man, A man's essential nature – two-footed animal, or aught else it may be. Then, if we are to syllogize, A must be predicated of all B. But this premiss will be mediated by a fresh definition, which consequently will also be the essential nature of man. Therefore the argument assumes what it has to prove, since B too is the essential nature of man. It is, however, the case in which there are only the two premisses – i.e. in which the premisses are primary and immediate – which we ought to investigate, because it best illustrates the point under discussion.

Thus they who prove the essential nature of soul or man or anything else through reciprocating terms beg the question. It would be begging the question, for example, to contend that the soul is that which causes its own life, and that what causes its own life is a self-moving number; for one would have to postulate that the soul is a self-moving number in the sense of being identical with it. For if A is predicable as a mere consequent of B and B of C, A will not on that account be the definable form of C: A will merely be what it was true to say of C. Even if A is predicated of all B inasmuch as B is identical with

a species of A, still it will not follow: being an animal is predicated of being a man – since it is true that in all instances to be human is to be animal, just as it is also true that every man is an animal – but not as identical with being man.

We conclude, then, that unless one takes both the premisses as predicating essence, one cannot infer that A is the definable form and essence of C: but if one does so take them, in assuming B one will have assumed, before drawing the conclusion, what the definable form of C is; so that there has been no inference, for one has begged the question.

5

Nor, as was said in my formal logic, is the method of division a process of inference at all, since at no point does the characterization of the subject follow necessarily from the premising of certain other facts: division demonstrates as little as does induction. For in a genuine demonstration the conclusion must not be put as a question nor depend on a concession, but must follow necessarily from its premisses, even if the respondent deny it. The definer asks 'Is man animal or inanimate?' and then assumes – he has not inferred – that man is animal. Next, when presented with an exhaustive division of animal into terrestrial and aquatic, he assumes that man is terrestrial. Moreover, that man is the complete formula, terrestrial-animal, does not follow necessarily from the premisses: this too is an assumption, and equally an assumption whether the division comprises many differentiae or few. (Indeed as this method of division is used by those who proceed by it, even truths that can be inferred actually fail to appear as such.) For why should not the whole of this formula

be true of man, and yet not exhibit his essential nature or definable form? Again, what guarantee is there against an unessential addition, or against the omission of the final or of an intermediate determinant of the substantial being?

The champion of division might here urge that though these lapses do occur, yet we can solve that difficulty if all the attributes we assume are constituents of the definable form, and if, postulating the genus, we produce by division the requisite uninterrupted sequence of terms, and omit nothing; and that indeed we cannot fail to fulfil these conditions if what is to be divided falls whole into the division at each stage, and none of it is omitted; and that this – the dividendum – must without further question be (ultimately) incapable of fresh specific division. Nevertheless, we reply, division does not involve inference; if it gives knowledge, it gives it in another way. Nor is there any absurdity in this: induction, perhaps, is not demonstration any more than is division, et it does make evident some truth. Yet to state a definition reached by division is not to state a conclusion: as, when conclusions are drawn without their appropriate middles, the alleged necessity by which the inference follows from the premisses is open to a question as to the reason for it, so definitions reached by division invite the same question.

Thus to the question 'What is the essential nature of man?' the divider replies 'Animal, mortal, footed, biped, wingless'; and when at each step he is asked 'Why?', he will say, and, as he thinks, proves by division, that all animal is mortal or immortal: but such a formula taken in its entirety is not definition; so that even if division does demonstrate its formula, definition at any rate does not turn out to be a conclusion of inference.

6

Can we nevertheless actually demonstrate what a thing essentially and substantially is, but hypothetically, i.e. by premising (1) that its definable form is constituted by the 'peculiar' attributes of its essential nature; (2) that such and such are the only attributes of its essential nature, and that the complete synthesis of them is peculiar to the thing; and thus – since in this synthesis consists the being of the thing – obtaining our conclusion? Or is the truth that, since proof must be through the middle term, the definable form is once more assumed in this minor premiss too?

Further, just as in syllogizing we do not premise what syllogistic inference is (since the premisses from which we conclude must be related as whole and part), so the definable form must not fall within the syllogism but remain outside the premisses posited. It is only against a doubt as to its having been a syllogistic inference at all that we have to defend our argument as conforming to the definition of syllogism. It is only when some one doubts whether the conclusion proved is the definable form that we have to defend it as conforming to the definition of definable form which we assumed. Hence syllogistic inference must be possible even without the express statement of what syllogism is or what definable form is.

The following type of hypothetical proof also begs the question. If evil is definable as the divisible, and the definition of a thing's contrary – if it has one the contrary of the thing's definition; then, if good is the contrary of evil and the indivisible of the divisible, we conclude that to be good is essentially to be indivisible. The question is begged because definable form is assumed as a premiss, and as a premiss which is to prove definable form. 'But not the same definable form', you may object. That I admit, for in demonstrations also we premise that

‘this’ is predicable of ‘that’; but in this premiss the term we assert of the minor is neither the major itself nor a term identical in definition, or convertible, with the major.

Again, both proof by division and the syllogism just described are open to the question why man should be animal-biped-terrestrial and not merely animal and terrestrial, since what they premise does not ensure that the predicates shall constitute a genuine unity and not merely belong to a single subject as do musical and grammatical when predicated of the same man.

7

How then by definition shall we prove substance or essential nature? We cannot show it as a fresh fact necessarily following from the assumption of premisses admitted to be facts – the method of demonstration: we may not proceed as by induction to establish a universal on the evidence of groups of particulars which offer no exception, because induction proves not what the essential nature of a thing is but that it has or has not some attribute. Therefore, since presumably one cannot prove essential nature by an appeal to sense perception or by pointing with the finger, what other method remains?

To put it another way: how shall we by definition prove essential nature? He who knows what human – or any other – nature is, must know also that man exists; for no one knows the nature of what does not exist – one can know the meaning of the phrase or name ‘goat-stag’ but not what the essential nature of a goat-stag is. But further, if definition can prove what is the essential nature of a thing, can it also prove that it exists? And how will it prove them both by the same process, since

definition exhibits one single thing and demonstration another single thing, and what human nature is and the fact that man exists are not the same thing? Then too we hold that it is by demonstration that the being of everything must be proved – unless indeed to be were its essence; and, since being is not a genus, it is not the essence of anything. Hence the being of anything as fact is matter for demonstration; and this is the actual procedure of the sciences, for the geometer assumes the meaning of the word triangle, but that it is possessed of some attribute he proves. What is it, then, that we shall prove in defining essential nature? Triangle? In that case a man will know by definition what a thing's nature is without knowing whether it exists. But that is impossible.

Moreover it is clear, if we consider the methods of defining actually in use, that definition does not prove that the thing defined exists: since even if there does actually exist something which is equidistant from a centre, yet why should the thing named in the definition exist? Why, in other words, should this be the formula defining circle? One might equally well call it the definition of mountain copper. For definitions do not carry a further guarantee that the thing defined can exist or that it is what they claim to define: one can always ask why.

Since, therefore, to define is to prove either a thing's essential nature or the meaning of its name, we may conclude that definition, if it in no sense proves essential nature, is a set of words signifying precisely what a name signifies. But that were a strange consequence; for (1) both what is not substance and what does not exist at all would be definable, since even non-existents can be signified by a name: (2) all sets of words or sentences would be definitions, since any kind of sentence could be given a name; so that we should all be talking in definitions, and even the Iliad would be a definition: (3) no demonstration can prove that any particular name means any

particular thing: neither, therefore, do definitions, in addition to revealing the meaning of a name, also reveal that the name has this meaning. It appears then from these considerations that neither definition and syllogism nor their objects are identical, and further that definition neither demonstrates nor proves anything, and that knowledge of essential nature is not to be obtained either by definition or by demonstration.

8

We must now start afresh and consider which of these conclusions are sound and which are not, and what is the nature of definition, and whether essential nature is in any sense demonstrable and definable or in none.

Now to know its essential nature is, as we said, the same as to know the cause of a thing's existence, and the proof of this depends on the fact that a thing must have a cause. Moreover, this cause is either identical with the essential nature of the thing or distinct from it; and if its cause is distinct from it, the essential nature of the thing is either demonstrable or indemonstrable. Consequently, if the cause is distinct from the thing's essential nature and demonstration is possible, the cause must be the middle term, and, the conclusion proved being universal and affirmative, the proof is in the first figure. So the method just examined of proving it through another essential nature would be one way of proving essential nature, because a conclusion containing essential nature must be inferred through a middle which is an essential nature just as a 'peculiar' property must be inferred through a middle which is a 'peculiar' property; so that of the two definable natures of a single thing this method will prove one and not the other.

Now it was said before that this method could not amount to demonstration of essential nature – it is actually a dialectical proof of it – so let us begin again and explain by what method it can be demonstrated. When we are aware of a fact we seek its reason, and though sometimes the fact and the reason dawn on us simultaneously, yet we cannot apprehend the reason a moment sooner than the fact; and clearly in just the same way we cannot apprehend a thing's definable form without apprehending that it exists, since while we are ignorant whether it exists we cannot know its essential nature. Moreover we are aware whether a thing exists or not sometimes through apprehending an element in its character, and sometimes accidentally, as, for example, when we are aware of thunder as a noise in the clouds, of eclipse as a privation of light, or of man as some species of animal, or of the soul as a self-moving thing. As often as we have accidental knowledge that the thing exists, we must be in a wholly negative state as regards awareness of its essential nature; for we have not got genuine knowledge even of its existence, and to search for a thing's essential nature when we are unaware that it exists is to search for nothing. On the other hand, whenever we apprehend an element in the thing's character there is less difficulty. Thus it follows that the degree of our knowledge of a thing's essential nature is determined by the sense in which we are aware that it exists. Let us then take the following as our first instance of being aware of an element in the essential nature. Let A be eclipse, C the moon, B the earth's acting as a screen. Now to ask whether the moon is eclipsed or not is to ask whether or not B has occurred. But that is precisely the same as asking whether A has a defining condition; and if this condition actually exists, we assert that A also actually exists. Or again we may ask which side of a contradiction the defining condition necessitates: does it make the angles of a triangle equal or not equal to two right angles? When we have found the answer, if the premisses are

immediate, we know fact and reason together; if they are not immediate, we know the fact without the reason, as in the following example: let C be the moon, A eclipse, B the fact that the moon fails to produce shadows though she is full and though no visible body intervenes between us and her. Then if B, failure to produce shadows in spite of the absence of an intervening body, is attributable A to C, and eclipse, is attributable to B, it is clear that the moon is eclipsed, but the reason why is not yet clear, and we know that eclipse exists, but we do not know what its essential nature is. But when it is clear that A is attributable to C and we proceed to ask the reason of this fact, we are inquiring what is the nature of B: is it the earth's acting as a screen, or the moon's rotation or her extinction? But B is the definition of the other term, viz. in these examples, of the major term A; for eclipse is constituted by the earth acting as a screen. Thus, (1) 'What is thunder?' 'The quenching of fire in cloud', and (2) 'Why does it thunder?' 'Because fire is quenched in the cloud', are equivalent. Let C be cloud, A thunder, B the quenching of fire. Then B is attributable to C, cloud, since fire is quenched in it; and A, noise, is attributable to B; and B is assuredly the definition of the major term A. If there be a further mediating cause of B, it will be one of the remaining partial definitions of A.

We have stated then how essential nature is discovered and becomes known, and we see that, while there is no syllogism – i.e. no demonstrative syllogism – of essential nature, yet it is through syllogism, viz. demonstrative syllogism, that essential nature is exhibited. So we conclude that neither can the essential nature of anything which has a cause distinct from itself be known without demonstration, nor can it be demonstrated; and this is what we contended in our preliminary discussions.

9

Now while some things have a cause distinct from themselves, others have not. Hence it is evident that there are essential natures which are immediate, that is are basic premisses; and of these not only that they are but also what they are must be assumed or revealed in some other way. This too is the actual procedure of the arithmetician, who assumes both the nature and the existence of unit. On the other hand, it is possible (in the manner explained) to exhibit through demonstration the essential nature of things which have a 'middle', i.e. a cause of their substantial being other than that being itself; but we do not thereby demonstrate it.

10

Since definition is said to be the statement of a thing's nature, obviously one kind of definition will be a statement of the meaning of the name, or of an equivalent nominal formula. A definition in this sense tells you, e.g. the meaning of the phrase 'triangular character'. When we are aware that triangle exists, we inquire the reason why it exists. But it is difficult thus to learn the definition of things the existence of which we do not genuinely know – the cause of this difficulty being, as we said before, that we only know accidentally whether or not the thing exists. Moreover, a statement may be a unity in either of two ways, by conjunction, like the Iliad, or because it exhibits a single predicate as inhering not accidentally in a single subject.

That then is one way of defining definition. Another kind of definition is a formula exhibiting the cause of a thing's

existence. Thus the former signifies without proving, but the latter will clearly be a quasi-demonstration of essential nature, differing from demonstration in the arrangement of its terms. For there is a difference between stating why it thunders, and stating what is the essential nature of thunder; since the first statement will be ‘Because fire is quenched in the clouds’, while the statement of what the nature of thunder is will be ‘The noise of fire being quenched in the clouds’. Thus the same statement takes a different form: in one form it is continuous demonstration, in the other definition. Again, thunder can be defined as noise in the clouds, which is the conclusion of the demonstration embodying essential nature. On the other hand the definition of immediates is an indemonstrable positing of essential nature.

We conclude then that definition is (a) an indemonstrable statement of essential nature, or (b) a syllogism of essential nature differing from demonstration in grammatical form, or (c) the conclusion of a demonstration giving essential nature.

Our discussion has therefore made plain (1) in what sense and of what things the essential nature is demonstrable, and in what sense and of what things it is not; (2) what are the various meanings of the term definition, and in what sense and of what things it proves the essential nature, and in what sense and of what things it does not; (3) what is the relation of definition to demonstration, and how far the same thing is both definable and demonstrable and how far it is not.

11

We think we have scientific knowledge when we know the cause, and there are four causes: (1) the definable form, (2) an

antecedent which necessitates a consequent, (3) the efficient cause, (4) the final cause. Hence each of these can be the middle term of a proof, for (a) though the inference from antecedent to necessary consequent does not hold if only one premiss is assumed – two is the minimum – still when there are two it holds on condition that they have a single common middle term. So it is from the assumption of this single middle term that the conclusion follows necessarily. The following example will also show this. Why is the angle in a semicircle a right angle? – or from what assumption does it follow that it is a right angle? Thus, let A be right angle, B the half of two right angles, C the angle in a semicircle. Then B is the cause in virtue of which A, right angle, is attributable to C, the angle in a semicircle, since B=A and the other, viz. C,=B, for C is half of two right angles. Therefore it is the assumption of B, the half of two right angles, from which it follows that A is attributable to C, i.e. that the angle in a semicircle is a right angle. Moreover, B is identical with (b) the defining form of A, since it is what A's definition signifies. Moreover, the formal cause has already been shown to be the middle. (c) 'Why did the Athenians become involved in the Persian war?' means 'What cause originated the waging of war against the Athenians?' and the answer is, 'Because they raided Sardis with the Eretrians', since this originated the war. Let A be war, B unprovoked raiding, C the Athenians. Then B, unprovoked raiding, is true of C, the Athenians, and A is true of B, since men make war on the unjust aggressor. So A, having war waged upon them, is true of B, the initial aggressors, and B is true of C, the Athenians, who were the aggressors. Hence here too the cause – in this case the efficient cause – is the middle term. (d) This is no less true where the cause is the final cause. E.g. why does one take a walk after supper? For the sake of one's health. Why does a house exist? For the preservation of one's goods. The end in view is in the one case health, in the other preservation. To ask the reason why one must walk after supper

is precisely to ask to what end one must do it. Let C be walking after supper, B the non-regurgitation of food, A health. Then let walking after supper possess the property of preventing food from rising to the orifice of the stomach, and let this condition be healthy; since it seems that B, the non-regurgitation of food, is attributable to C, taking a walk, and that A, health, is attributable to B. What, then, is the cause through which A, the final cause, inheres in C? It is B, the non-regurgitation of food; but B is a kind of definition of A, for A will be explained by it. Why is B the cause of A's belonging to C? Because to be in a condition such as B is to be in health. The definitions must be transposed, and then the detail will become clearer. Incidentally, here the order of coming to be is the reverse of what it is in proof through the efficient cause: in the efficient order the middle term must come to be first, whereas in the teleological order the minor, C, must first take place, and the end in view comes last in time.

The same thing may exist for an end and be necessitated as well. For example, light shines through a lantern (1) because that which consists of relatively small particles necessarily passes through pores larger than those particles – assuming that light does issue by penetration – and (2) for an end, namely to save us from stumbling. If then, a thing can exist through two causes, can it come to be through two causes – as for instance if thunder be a hiss and a roar necessarily produced by the quenching of fire, and also designed, as the Pythagoreans say, for a threat to terrify those that lie in Tartarus? Indeed, there are very many such cases, mostly among the processes and products of the natural world; for nature, in different senses of the term 'nature', produces now for an end, now by necessity.

Necessity too is of two kinds. It may work in accordance with a thing's natural tendency, or by constraint and in opposition to it;

as, for instance, by necessity a stone is borne both upwards and downwards, but not by the same necessity.

Of the products of man's intelligence some are never due to chance or necessity but always to an end, as for example a house or a statue; others, such as health or safety, may result from chance as well.

It is mostly in cases where the issue is indeterminate (though only where the production does not originate in chance, and the end is consequently good), that a result is due to an end, and this is true alike in nature or in art. By chance, on the other hand, nothing comes to be for an end.

12

The effect may be still coming to be, or its occurrence may be past or future, yet the cause will be the same as when it is actually existent – for it is the middle which is the cause – except that if the effect actually exists the cause is actually existent, if it is coming to be so is the cause, if its occurrence is past the cause is past, if future the cause is future. For example, the moon was eclipsed because the earth intervened, is becoming eclipsed because the earth is in process of intervening, will be eclipsed because the earth will intervene, is eclipsed because the earth intervenes.

To take a second example: assuming that the definition of ice is solidified water, let C be water, A solidified, B the middle, which is the cause, namely total failure of heat. Then B is attributed to C, and A, solidification, to B: ice when B is occurring, has formed when B has occurred, and will form when B shall occur.

This sort of cause, then, and its effect come to be simultaneously when they are in process of becoming, and exist simultaneously when they actually exist; and the same holds good when they are past and when they are future. But what of cases where they are not simultaneous? Can causes and effects different from one another form, as they seem to us to form, a continuous succession, a past effect resulting from a past cause different from itself, a future effect from a future cause different from it, and an effect which is coming-to-be from a cause different from and prior to it? Now on this theory it is from the posterior event that we reason (and this though these later events actually have their source of origin in previous events – a fact which shows that also when the effect is coming-to-be we still reason from the posterior event), and from the event we cannot reason (we cannot argue that because an event A has occurred, therefore an event B has occurred subsequently to A but still in the past – and the same holds good if the occurrence is future) – cannot reason because, be the time interval definite or indefinite, it will never be possible to infer that because it is true to say that A occurred, therefore it is true to say that B, the subsequent event, occurred; for in the interval between the events, though A has already occurred, the latter statement will be false. And the same argument applies also to future events; i.e. one cannot infer from an event which occurred in the past that a future event will occur. The reason of this is that the middle must be homogeneous, past when the extremes are past, future when they are future, coming to be when they are coming-to-be, actually existent when they are actually existent; and there cannot be a middle term homogeneous with extremes respectively past and future. And it is a further difficulty in this theory that the time interval can be neither indefinite nor definite, since during it the inference will be false. We have also to inquire what it is that holds events together so that the coming-to-be now occurring in actual things follows

upon a past event. It is evident, we may suggest, that a past event and a present process cannot be 'contiguous', for not even two past events can be 'contiguous'. For past events are limits and atomic; so just as points are not 'contiguous' neither are past events, since both are indivisible. For the same reason a past event and a present process cannot be 'contiguous', for the process is divisible, the event indivisible. Thus the relation of present process to past event is analogous to that of line to point, since a process contains an infinity of past events. These questions, however, must receive a more explicit treatment in our general theory of change.

The following must suffice as an account of the manner in which the middle would be identical with the cause on the supposition that coming-to-be is a series of consecutive events: for in the terms of such a series too the middle and major terms must form an immediate premiss; e.g. we argue that, since C has occurred, therefore A occurred: and C's occurrence was posterior, A's prior; but C is the source of the inference because it is nearer to the present moment, and the starting-point of time is the present. We next argue that, since D has occurred, therefore C occurred. Then we conclude that, since D has occurred, therefore A must have occurred; and the cause is C, for since D has occurred C must have occurred, and since C has occurred A must previously have occurred.

If we get our middle term in this way, will the series terminate in an immediate premiss, or since, as we said, no two events are 'contiguous', will a fresh middle term always intervene because there is an infinity of middles? No: though no two events are 'contiguous', yet we must start from a premiss consisting of a middle and the present event as major. The like is true of future events too, since if it is true to say that D will exist, it must be a prior truth to say that A will exist, and the cause of this conclusion is C; for if D will exist, C will exist prior to D, and if C

will exist, A will exist prior to it. And here too the same infinite divisibility might be urged, since future events are not 'contiguous'. But here too an immediate basic premiss must be assumed. And in the world of fact this is so: if a house has been built, then blocks must have been quarried and shaped. The reason is that a house having been built necessitates a foundation having been laid, and if a foundation has been laid blocks must have been shaped beforehand. Again, if a house will be built, blocks will similarly be shaped beforehand; and proof is through the middle in the same way, for the foundation will exist before the house.

Now we observe in Nature a certain kind of circular process of coming-to-be; and this is possible only if the middle and extreme terms are reciprocal, since conversion is conditioned by reciprocity in the terms of the proof. This – the convertibility of conclusions and premisses – has been proved in our early chapters, and the circular process is an instance of this. In actual fact it is exemplified thus: when the earth had been moistened an exhalation was bound to rise, and when an exhalation had risen cloud was bound to form, and from the formation of cloud rain necessarily resulted and by the fall of rain the earth was necessarily moistened: but this was the starting-point, so that a circle is completed; for posit any one of the terms and another follows from it, and from that another, and from that again the first.

Some occurrences are universal (for they are, or come-to-be what they are, always and in ever case); others again are not always what they are but only as a general rule: for instance, not every man can grow a beard, but it is the general rule. In the case of such connexions the middle term too must be a general rule. For if A is predicated universally of B and B of C, A too must be predicated always and in every instance of C, since to hold in every instance and always is of the nature of the universal. But

we have assumed a connexion which is a general rule; consequently the middle term B must also be a general rule. So connexions which embody a general rule – i.e. which exist or come to be as a general rule – will also derive from immediate basic premisses.

13

We have already explained how essential nature is set out in the terms of a demonstration, and the sense in which it is or is not demonstrable or definable; so let us now discuss the method to be adopted in tracing the elements predicated as constituting the definable form.

Now of the attributes which inhere always in each several thing there are some which are wider in extent than it but not wider than its genus (by attributes of wider extent mean all such as are universal attributes of each several subject, but in their application are not confined to that subject). while an attribute may inhere in every triad, yet also in a subject not a triad – as being inheres in triad but also in subjects not numbers at all – odd on the other hand is an attribute inhering in every triad and of wider application (inhering as it does also in pentad), but which does not extend beyond the genus of triad; for pentad is a number, but nothing outside number is odd. It is such attributes which we have to select, up to the exact point at which they are severally of wider extent than the subject but collectively coextensive with it; for this synthesis must be the substance of the thing. For example every triad possesses the attributes number, odd, and prime in both senses, i.e. not only as possessing no divisors, but also as not being a sum of numbers. This, then, is precisely what triad is, viz. a number, odd, and

prime in the former and also the latter sense of the term: for these attributes taken severally apply, the first two to all odd numbers, the last to the dyad also as well as to the triad, but, taken collectively, to no other subject. Now since we have shown above' that attributes predicated as belonging to the essential nature are necessary and that universals are necessary, and since the attributes which we select as inhering in triad, or in any other subject whose attributes we select in this way, are predicated as belonging to its essential nature, triad will thus possess these attributes necessarily. Further, that the synthesis of them constitutes the substance of triad is shown by the following argument. If it is not identical with the being of triad, it must be related to triad as a genus named or nameless. It will then be of wider extent than triad – assuming that wider potential extent is the character of a genus. If on the other hand this synthesis is applicable to no subject other than the individual triads, it will be identical with the being of triad, because we make the further assumption that the substance of each subject is the predication of elements in its essential nature down to the last differentia characterizing the individuals. It follows that any other synthesis thus exhibited will likewise be identical with the being of the subject.

The author of a hand-book on a subject that is a generic whole should divide the genus into its first infimae species – number e.g. into triad and dyad – and then endeavour to seize their definitions by the method we have described – the definition, for example, of straight line or circle or right angle. After that, having established what the category is to which the subaltern genus belongs – quantity or quality, for instance – he should examine the properties 'peculiar' to the species, working through the proximate common differentiae. He should proceed thus because the attributes of the genera compounded of the infimae species will be clearly given by the definitions of the species; since the basic element of them all is the definition, i.e.

the simple infirma species, and the attributes inhere essentially in the simple infimae species, in the genera only in virtue of these.

Divisions according to differentiae are a useful accessory to this method. What force they have as proofs we did, indeed, explain above, but that merely towards collecting the essential nature they may be of use we will proceed to show. They might, indeed, seem to be of no use at all, but rather to assume everything at the start and to be no better than an initial assumption made without division. But, in fact, the order in which the attributes are predicated does make a difference – it matters whether we say animal-tame-biped, or biped-animal-tame. For if every definable thing consists of two elements and 'animal-tame' forms a unity, and again out of this and the further differentia man (or whatever else is the unity under construction) is constituted, then the elements we assume have necessarily been reached by division. Again, division is the only possible method of avoiding the omission of any element of the essential nature. Thus, if the primary genus is assumed and we then take one of the lower divisions, the dividendum will not fall whole into this division: e.g. it is not all animal which is either whole-winged or split-winged but all winged animal, for it is winged animal to which this differentiation belongs. The primary differentiation of animal is that within which all animal falls. The like is true of every other genus, whether outside animal or a subaltern genus of animal; e.g. the primary differentiation of bird is that within which falls every bird, of fish that within which falls every fish. So, if we proceed in this way, we can be sure that nothing has been omitted: by any other method one is bound to omit something without knowing it.

To define and divide one need not know the whole of existence. Yet some hold it impossible to know the differentiae

distinguishing each thing from every single other thing without knowing every single other thing; and one cannot, they say, know each thing without knowing its differentiae, since everything is identical with that from which it does not differ, and other than that from which it differs. Now first of all this is a fallacy: not every differentia precludes identity, since many differentiae inhere in things specifically identical, though not in the substance of these nor essentially. Secondly, when one has taken one's differing pair of opposites and assumed that the two sides exhaust the genus, and that the subject one seeks to define is present in one or other of them, and one has further verified its presence in one of them; then it does not matter whether or not one knows all the other subjects of which the differentiae are also predicated. For it is obvious that when by this process one reaches subjects incapable of further differentiation one will possess the formula defining the substance. Moreover, to postulate that the division exhausts the genus is not illegitimate if the opposites exclude a middle; since if it is the differentia of that genus, anything contained in the genus must lie on one of the two sides.

In establishing a definition by division one should keep three objects in view: (1) the admission only of elements in the definable form, (2) the arrangement of these in the right order, (3) the omission of no such elements. The first is feasible because one can establish genus and differentia through the topic of the genus, just as one can conclude the inherence of an accident through the topic of the accident. The right order will be achieved if the right term is assumed as primary, and this will be ensured if the term selected is predicable of all the others but not all they of it; since there must be one such term. Having assumed this we at once proceed in the same way with the lower terms; for our second term will be the first of the remainder, our third the first of those which follow the second in a 'contiguous' series, since when the higher term is excluded,

that term of the remainder which is ‘contiguous’ to it will be primary, and so on. Our procedure makes it clear that no elements in the definable form have been omitted: we have taken the differentia that comes first in the order of division, pointing out that animal, e.g. is divisible exhaustively into A and B, and that the subject accepts one of the two as its predicate. Next we have taken the differentia of the whole thus reached, and shown that the whole we finally reach is not further divisible – i.e. that as soon as we have taken the last differentia to form the concrete totality, this totality admits of no division into species. For it is clear that there is no superfluous addition, since all these terms we have selected are elements in the definable form; and nothing lacking, since any omission would have to be a genus or a differentia. Now the primary term is a genus, and this term taken in conjunction with its differentiae is a genus: moreover the differentiae are all included, because there is now no further differentia; if there were, the final concrete would admit of division into species, which, we said, is not the case.

To resume our account of the right method of investigation: We must start by observing a set of similar – i.e. specifically identical – individuals, and consider what element they have in common. We must then apply the same process to another set of individuals which belong to one species and are generically but not specifically identical with the former set. When we have established what the common element is in all members of this second species, and likewise in members of further species, we should again consider whether the results established possess any identity, and persevere until we reach a single formula, since this will be the definition of the thing. But if we reach not one formula but two or more, evidently the definiendum cannot be one thing but must be more than one. I may illustrate my meaning as follows. If we were inquiring what the essential nature of pride is, we should examine instances of proud men

we know of to see what, as such, they have in common; e.g. if Alcibiades was proud, or Achilles and Ajax were proud, we should find on inquiring what they all had in common, that it was intolerance of insult; it was this which drove Alcibiades to war, Achilles wrath, and Ajax to suicide. We should next examine other cases, Lysander, for example, or Socrates, and then if these have in common indifference alike to good and ill fortune, I take these two results and inquire what common element have equanimity amid the vicissitudes of life and impatience of dishonour. If they have none, there will be two genera of pride. Besides, every definition is always universal and commensurate: the physician does not prescribe what is healthy for a single eye, but for all eyes or for a determinate species of eye. It is also easier by this method to define the single species than the universal, and that is why our procedure should be from the several species to the universal genera – this for the further reason too that equivocation is less readily detected in genera than in infimae species. Indeed, perspicuity is essential in definitions, just as inferential movement is the minimum required in demonstrations; and we shall attain perspicuity if we can collect separately the definition of each species through the group of singulars which we have established e.g. the definition of similarity not unqualified but restricted to colours and to figures; the definition of acuteness, but only of sound – and so proceed to the common universal with a careful avoidance of equivocation. We may add that if dialectical disputation must not employ metaphors, clearly metaphors and metaphorical expressions are precluded in definition: otherwise dialectic would involve metaphors.

14

In order to formulate the connexions we wish to prove we have to select our analyses and divisions. The method of selection consists in laying down the common genus of all our subjects of investigation – if e.g. they are animals, we lay down what the properties are which inhere in every animal. These established, we next lay down the properties essentially connected with the first of the remaining classes – e.g. if this first subgenus is bird, the essential properties of every bird – and so on, always characterizing the proximate subgenus. This will clearly at once enable us to say in virtue of what character the subgenera – man, e.g. or horse – possess their properties. Let A be animal, B the properties of every animal, C D E various species of animal. Then it is clear in virtue of what character B inheres in D – namely A – and that it inheres in C and E for the same reason: and throughout the remaining subgenera always the same rule applies.

We are now taking our examples from the traditional class-names, but we must not confine ourselves to considering these. We must collect any other common character which we observe, and then consider with what species it is connected and what.properties belong to it. For example, as the common properties of horned animals we collect the possession of a third stomach and only one row of teeth. Then since it is clear in virtue of what character they possess these attributes – namely their horned character – the next question is, to what species does the possession of horns attach?

Yet a further method of selection is by analogy: for we cannot find a single identical name to give to a squid's pounce, a fish's spine, and an animal's bone, although these too possess common properties as if there were a single osseous nature.

15

Some connexions that require proof are identical in that they possess an identical 'middle' e.g. a whole group might be proved through 'reciprocal replacement' – and of these one class are identical in genus, namely all those whose difference consists in their concerning different subjects or in their mode of manifestation. This latter class may be exemplified by the questions as to the causes respectively of echo, of reflection, and of the rainbow: the connexions to be proved which these questions embody are identical generically, because all three are forms of repercussion; but specifically they are different.

Other connexions that require proof only differ in that the 'middle' of the one is subordinate to the 'middle' of the other. For example: Why does the Nile rise towards the end of the month? Because towards its close the month is more stormy. Why is the month more stormy towards its close? Because the moon is waning. Here the one cause is subordinate to the other.

16

The question might be raised with regard to cause and effect whether when the effect is present the cause also is present; whether, for instance, if a plant sheds its leaves or the moon is eclipsed, there is present also the cause of the eclipse or of the fall of the leaves – the possession of broad leaves, let us say, in the latter case, in the former the earth's interposition. For, one might argue, if this cause is not present, these phenomena will have some other cause: if it is present, its effect will be at once implied by it – the eclipse by the earth's interposition, the fall of

the leaves by the possession of broad leaves; but if so, they will be logically coincident and each capable of proof through the other. Let me illustrate: Let A be deciduous character, B the possession of broad leaves, C vine. Now if A inheres in B (for every broad-leaved plant is deciduous), and B in C (every vine possessing broad leaves); then A inheres in C (every vine is deciduous), and the middle term B is the cause. But we can also demonstrate that the vine has broad leaves because it is deciduous. Thus, let D be broad-leaved, E deciduous, F vine. Then E inheres in F (since every vine is deciduous), and D in E (for every deciduous plant has broad leaves): therefore every vine has broad leaves, and the cause is its deciduous character. If, however, they cannot each be the cause of the other (for cause is prior to effect, and the earth's interposition is the cause of the moon's eclipse and not the eclipse of the interposition) – if, then, demonstration through the cause is of the reasoned fact and demonstration not through the cause is of the bare fact, one who knows it through the eclipse knows the fact of the earth's interposition but not the reasoned fact. Moreover, that the eclipse is not the cause of the interposition, but the interposition of the eclipse, is obvious because the interposition is an element in the definition of eclipse, which shows that the eclipse is known through the interposition and not vice versa.

On the other hand, can a single effect have more than one cause? One might argue as follows: if the same attribute is predicable of more than one thing as its primary subject, let B be a primary subject in which A inheres, and C another primary subject of A, and D and E primary subjects of B and C respectively. A will then inhere in D and E, and B will be the cause of A's inherence in D, C of A's inherence in E. The presence of the cause thus necessitates that of the effect, but the presence of the effect necessitates the presence not of all that may cause it but only of a cause which yet need not be the whole cause. We may, however, suggest that if the connexion to

be proved is always universal and commensurate, not only will the cause be a whole but also the effect will be universal and commensurate. For instance, deciduous character will belong exclusively to a subject which is a whole, and, if this whole has species, universally and commensurately to those species – i.e. either to all species of plant or to a single species. So in these universal and commensurate connexions the 'middle' and its effect must reciprocate, i.e. be convertible. Supposing, for example, that the reason why trees are deciduous is the coagulation of sap, then if a tree is deciduous, coagulation must be present, and if coagulation is present – not in any subject but in a tree – then that tree must be deciduous.

17

Can the cause of an identical effect be not identical in every instance of the effect but different? Or is that impossible? Perhaps it is impossible if the effect is demonstrated as essential and not as inhering in virtue of a symptom or an accident – because the middle is then the definition of the major term – though possible if the demonstration is not essential. Now it is possible to consider the effect and its subject as an accidental conjunction, though such conjunctions would not be regarded as connexions demanding scientific proof. But if they are accepted as such, the middle will correspond to the extremes, and be equivocal if they are equivocal, generically one if they are generically one. Take the question why proportionals alternate. The cause when they are lines, and when they are numbers, is both different and identical; different in so far as lines are lines and not numbers, identical as involving a given determinate increment. In all proportionals this is so. Again, the cause of likeness between colour and colour is other than that

between figure and figure; for likeness here is equivocal, meaning perhaps in the latter case equality of the ratios of the sides and equality of the angles, in the case of colours identity of the act of perceiving them, or something else of the sort. Again, connexions requiring proof which are identical by analogy middles also analogous.

The truth is that cause, effect, and subject are reciprocally predicable in the following way. If the species are taken severally, the effect is wider than the subject (e.g. the possession of external angles equal to four right angles is an attribute wider than triangle or are), but it is coextensive with the species taken collectively (in this instance with all figures whose external angles are equal to four right angles). And the middle likewise reciprocates, for the middle is a definition of the major; which is incidentally the reason why all the sciences are built up through definition.

We may illustrate as follows. Deciduous is a universal attribute of vine, and is at the same time of wider extent than vine; and of fig, and is of wider extent than fig: but it is not wider than but coextensive with the totality of the species. Then if you take the middle which is proximate, it is a definition of deciduous. I say that, because you will first reach a middle next the subject, and a premiss asserting it of the whole subject, and after that a middle – the coagulation of sap or something of the sort – proving the connexion of the first middle with the major: but it is the coagulation of sap at the junction of leaf-stalk and stem which defines deciduous.

If an explanation in formal terms of the inter-relation of cause and effect is demanded, we shall offer the following. Let A be an attribute of all B, and B of every species of D, but so that both A and B are wider than their respective subjects. Then B will be a universal attribute of each species of D (since I call such an

attribute universal even if it is not commensurate, and I call an attribute primary universal if it is commensurate, not with each species severally but with their totality), and it extends beyond each of them taken separately.

Thus, B is the cause of A's inherence in the species of D: consequently A must be of wider extent than B; otherwise why should B be the cause of A's inherence in D any more than A the cause of B's inherence in D? Now if A is an attribute of all the species of E, all the species of E will be united by possessing some common cause other than B: otherwise how shall we be able to say that A is predicable of all of which E is predicable, while E is not predicable of all of which A can be predicated? I mean how can there fail to be some special cause of A's inherence in E, as there was of A's inherence in all the species of D? Then are the species of E, too, united by possessing some common cause? This cause we must look for. Let us call it C.

We conclude, then, that the same effect may have more than one cause, but not in subjects specifically identical. For instance, the cause of longevity in quadrupeds is lack of bile, in birds a dry constitution – or certainly something different.

18

If immediate premisses are not reached at once, and there is not merely one middle but several middles, i.e. several causes; is the cause of the property's inherence in the several species the middle which is proximate to the primary universal, or the middle which is proximate to the species? Clearly the cause is that nearest to each species severally in which it is manifested, for that is the cause of the subject's falling under the universal. To illustrate formally: C is the cause of B's inherence in D; hence

C is the cause of A’s inherence in D, B of A’s inherence in C, while the cause of A’s inherence in B is B itself.

19

As regards syllogism and demonstration, the definition of, and the conditions required to produce each of them, are now clear, and with that also the definition of, and the conditions required to produce, demonstrative knowledge, since it is the same as demonstration. As to the basic premisses, how they become known and what is the developed state of knowledge of them is made clear by raising some preliminary problems.

We have already said that scientific knowledge through demonstration is impossible unless a man knows the primary immediate premisses. But there are questions which might be raised in respect of the apprehension of these immediate premisses: one might not only ask whether it is of the same kind as the apprehension of the conclusions, but also whether there is or is not scientific knowledge of both; or scientific knowledge of the latter, and of the former a different kind of knowledge; and, further, whether the developed states of knowledge are not innate but come to be in us, or are innate but at first unnoticed. Now it is strange if we possess them from birth; for it means that we possess apprehensions more accurate than demonstration and fail to notice them. If on the other hand we acquire them and do not previously possess them, how could we apprehend and learn without a basis of pre-existent knowledge? For that is impossible, as we used to find in the case of demonstration. So it emerges that neither can we possess them from birth, nor can they come to be in us if we are without knowledge of them to the extent of having no

such developed state at all. Therefore we must possess a capacity of some sort, but not such as to rank higher in accuracy than these developed states. And this at least is an obvious characteristic of all animals, for they possess a congenital discriminative capacity which is called sense-perception. But though sense-perception is innate in all animals, in some the sense-impression comes to persist, in others it does not. So animals in which this persistence does not come to be have either no knowledge at all outside the act of perceiving, or no knowledge of objects of which no impression persists; animals in which it does come into being have perception and can continue to retain the sense-impression in the soul: and when such persistence is frequently repeated a further distinction at once arises between those which out of the persistence of such sense-impressions develop a power of systematizing them and those which do not. So out of sense-perception comes to be what we call memory, and out of frequently repeated memories of the same thing develops experience; for a number of memories constitute a single experience. From experience again – i.e. from the universal now stabilized in its entirety within the soul, the one beside the many which is a single identity within them all – originate the skill of the craftsman and the knowledge of the man of science, skill in the sphere of coming to be and science in the sphere of being.

We conclude that these states of knowledge are neither innate in a determinate form, nor developed from other higher states of knowledge, but from sense-perception. It is like a rout in battle stopped by first one man making a stand and then another, until the original formation has been restored. The soul is so constituted as to be capable of this process.

Let us now restate the account given already, though with insufficient clearness. When one of a number of logically indiscriminable particulars has made a stand, the earliest

universal is present in the soul: for though the act of sense-perception is of the particular, its content is universal – is man, for example, not the man Callias. A fresh stand is made among these rudimentary universals, and the process does not cease until the indivisible concepts, the true universals, are established: e.g. such and such a species of animal is a step towards the genus animal, which by the same process is a step towards a further generalization.

Thus it is clear that we must get to know the primary premisses by induction; for the method by which even sense-perception implants the universal is inductive. Now of the thinking states by which we grasp truth, some are unfailingly true, others admit of error – opinion, for instance, and calculation, whereas scientific knowing and intuition are always true: further, no other kind of thought except intuition is more accurate than scientific knowledge, whereas primary premisses are more knowable than demonstrations, and all scientific knowledge is discursive. From these considerations it follows that there will be no scientific knowledge of the primary premisses, and since except intuition nothing can be truer than scientific knowledge, it will be intuition that apprehends the primary premisses – a result which also follows from the fact that demonstration cannot be the originative source of demonstration, nor, consequently, scientific knowledge of scientific knowledge.If, therefore, it is the only other kind of true thinking except scientific knowing, intuition will be the originative source of scientific knowledge. And the originative source of science grasps the original basic premiss, while science as a whole is similarly related as originative source to the whole body of fact.

Aristotle – Topics

[Translated by W. A. Pickard-Cambridge]

Book I

1

Our treatise proposes to find a line of inquiry whereby we shall be able to reason from opinions that are generally accepted about every problem propounded to us, and also shall ourselves, when standing up to an argument, avoid saying anything that will obstruct us. First, then, we must say what reasoning is, and what its varieties are, in order to grasp dialectical reasoning: for this is the object of our search in the treatise before us.

Now reasoning is an argument in which, certain things being laid down, something other than these necessarily comes about through them. (a) It is a 'demonstration', when the premisses from which the reasoning starts are true and primary, or are such that our knowledge of them has originally come through premisses which are primary and true: (b) reasoning, on the other hand, is 'dialectical', if it reasons from opinions that are generally accepted. Things are 'true' and 'primary' which are believed on the strength not of anything else but of themselves: for in regard to the first principles of science it is improper to ask any further for the why and wherefore of them; each of the first principles should command belief in and by itself. On the other hand, those opinions are 'generally accepted' which are accepted by every one or by the majority or by the philosophers – i.e. by all, or by the majority, or by the most notable and

illustrious of them. Again (c), reasoning is 'contentious' if it starts from opinions that seem to be generally accepted, but are not really such, or again if it merely seems to reason from opinions that are or seem to be generally accepted. For not every opinion that seems to be generally accepted actually is generally accepted. For in none of the opinions which we call generally accepted is the illusion entirely on the surface, as happens in the case of the principles of contentious arguments; for the nature of the fallacy in these is obvious immediately, and as a rule even to persons with little power of comprehension. So then, of the contentious reasonings mentioned, the former really deserves to be called 'reasoning' as well, but the other should be called 'contentious reasoning', but not 'reasoning', since it appears to reason, but does not really do so. Further (d), besides all the reasonings we have mentioned there are the mis-reasonings that start from the premisses peculiar to the special sciences, as happens (for example) in the case of geometry and her sister sciences. For this form of reasoning appears to differ from the reasonings mentioned above; the man who draws a false figure reasons from things that are neither true and primary, nor yet generally accepted. For he does not fall within the definition; he does not assume opinions that are received either by every one or by the majority or by philosophers – that is to say, by all, or by most, or by the most illustrious of them – but he conducts his reasoning upon assumptions which, though appropriate to the science in question, are not true; for he effects his mis-reasoning either by describing the semicircles wrongly or by drawing certain lines in a way in which they could not be drawn.

The foregoing must stand for an outline survey of the species of reasoning. In general, in regard both to all that we have already discussed and to those which we shall discuss later, we may remark that that amount of distinction between them may serve, because it is not our purpose to give the exact definition

of any of them; we merely want to describe them in outline; we consider it quite enough from the point of view of the line of inquiry before us to be able to recognize each of them in some sort of way.

2

Next in order after the foregoing, we must say for how many and for what purposes the treatise is useful. They are three – intellectual training, casual encounters, and the philosophical sciences. That it is useful as a training is obvious on the face of it. The possession of a plan of inquiry will enable us more easily to argue about the subject proposed. For purposes of casual encounters, it is useful because when we have counted up the opinions held by most people, we shall meet them on the ground not of other people's convictions but of their own, while we shift the ground of any argument that they appear to us to state unsoundly. For the study of the philosophical sciences it is useful, because the ability to raise searching difficulties on both sides of a subject will make us detect more easily the truth and error about the several points that arise. It has a further use in relation to the ultimate bases of the principles used in the several sciences. For it is impossible to discuss them at all from the principles proper to the particular science in hand, seeing that the principles are the prius of everything else: it is through the opinions generally held on the particular points that these have to be discussed, and this task belongs properly, or most appropriately, to dialectic: for dialectic is a process of criticism wherein lies the path to the principles of all inquiries.

3

We shall be in perfect possession of the way to proceed when we are in a position like that which we occupy in regard to rhetoric and medicine and faculties of that kind: this means the doing of that which we choose with the materials that are available. For it is not every method that the rhetorician will employ to persuade, or the doctor to heal; still, if he omits none of the available means, we shall say that his grasp of the science is adequate.

4

First, then, we must see of what parts our inquiry consists. Now if we were to grasp (a) with reference to how many, and what kind of, things arguments take place, and with what materials they start, and (b) how we are to become well supplied with these, we should have sufficiently won our goal. Now the materials with which arguments start are equal in number, and are identical, with the subjects on which reasonings take place. For arguments start with 'propositions', while the subjects on which reasonings take place are 'problems'. Now every proposition and every problem indicates either a genus or a peculiarity or an accident – for the differentia too, applying as it does to a class (or genus), should be ranked together with the genus. Since, however, of what is peculiar to anything part signifies its essence, while part does not, let us divide the 'peculiar' into both the aforesaid parts, and call that part which indicates the essence a 'definition', while of the remainder let us adopt the terminology which is generally current about these things, and speak of it as a 'property'. What we have said, then, makes it clear that according to our present division, the

elements turn out to be four, all told, namely either property or definition or genus or accident. Do not let any one suppose us to mean that each of these enunciated by itself constitutes a proposition or problem, but only that it is from these that both problems and propositions are formed. The difference between a problem and a proposition is a difference in the turn of the phrase. For if it be put in this way, «'An animal that walks on two feet» is the definition of man, is it not?' or '«Animal» is the genus of man, is it not?' the result is a proposition: but if thus, 'Is «an animal that walks on two feet» a definition of man or no?' [or 'Is «animal» his genus or no?'] the result is a problem. Similarly too in other cases. Naturally, then, problems and propositions are equal in number: for out of every proposition you will make a problem if you change the turn of the phrase.

5

We must now say what are 'definition', 'property', 'genus', and 'accident'. A 'definition' is a phrase signifying a thing's essence. It is rendered in the form either of a phrase in lieu of a term, or of a phrase in lieu of another phrase; for it is sometimes possible to define the meaning of a phrase as well. People whose rendering consists of a term only, try it as they may, clearly do not render the definition of the thing in question, because a definition is always a phrase of a certain kind. One may, however, use the word 'definitory' also of such a remark as 'The «becoming» is «beautiful»', and likewise also of the question, 'Are sensation and knowledge the same or different?', for argument about definitions is mostly concerned with questions of sameness and difference. In a word we may call 'definitory' everything that falls under the same branch of inquiry as definitions; and that all the above-mentioned

examples are of this character is clear on the face of them. For if we are able to argue that two things are the same or are different, we shall be well supplied by the same turn of argument with lines of attack upon their definitions as well: for when we have shown that they are not the same we shall have demolished the definition. Observe, please, that the converse of this last statement does not hold: for to show that they are the same is not enough to establish a definition. To show, however, that they are not the same is enough of itself to overthrow it.

A 'property' is a predicate which does not indicate the essence of a thing, but yet belongs to that thing alone, and is predicated convertibly of it. Thus it is a property of man to-be-capable of learning grammar: for if A be a man, then he is capable of learning grammar, and if he be capable of learning grammar, he is a man. For no one calls anything a 'property' which may possibly belong to something else, e.g. 'sleep' in the case of man, even though at a certain time it may happen to belong to him alone. That is to say, if any such thing were actually to be called a property, it will be called not a 'property' absolutely, but a 'temporary' or a 'relative' property: for 'being on the right hand side' is a temporary property, while 'two-footed' is in point of fact ascribed as a property in certain relations; e.g. it is a property of man relatively to a horse and a dog. That nothing which may belong to anything else than A is a convertible predicate of A is clear: for it does not necessarily follow that if something is asleep it is a man.

A 'genus' is what is predicated in the category of essence of a number of things exhibiting differences in kind. We should treat as predicates in the category of essence all such things as it would be appropriate to mention in reply to the question, 'What is the object before you?'; as, for example, in the case of man, if asked that question, it is appropriate to say 'He is an animal'. The question, 'Is one thing in the same genus as another or in a

different one?' is also a 'generic' question; for a question of that kind as well falls under the same branch of inquiry as the genus: for having argued that 'animal' is the genus of man, and likewise also of ox, we shall have argued that they are in the same genus; whereas if we show that it is the genus of the one but not of the other, we shall have argued that these things are not in the same genus.

An 'accident' is (i) something which, though it is none of the foregoing – i.e. neither a definition nor a property nor a genus yet belongs to the thing: (something which may possibly either belong or not belong to any one and the self-same thing, as (e.g.) the 'sitting posture' may belong or not belong to some self-same thing. Likewise also 'whiteness', for there is nothing to prevent the same thing being at one time white, and at another not white. Of the definitions of accident the second is the better: for if he adopts the first, any one is bound, if he is to understand it, to know already what 'definition' and 'genus' and 'property' are, whereas the second is sufficient of itself to tell us the essential meaning of the term in question. To Accident are to be attached also all comparisons of things together, when expressed in language that is drawn in any kind of way from what happens (accidit) to be true of them; such as, for example, the question, 'Is the honourable or the expedient preferable?' and 'Is the life of virtue or the life of self-indulgence the pleasanter?', and any other problem which may happen to be phrased in terms like these. For in all such cases the question is 'to which of the two does the predicate in question happen (accidit) to belong more closely?' It is clear on the face of it that there is nothing to prevent an accident from becoming a temporary or relative property. Thus the sitting posture is an accident, but will be a temporary property, whenever a man is the only person sitting, while if he be not the only one sitting, it is still a property relatively to those who are not sitting. So then, there is nothing to prevent an accident from becoming both a

relative and a temporary property; but a property absolutely it will never be.

6

We must not fail to observe that all remarks made in criticism of a 'property' and 'genus' and 'accident' will be applicable to 'definitions' as well. For when we have shown that the attribute in question fails to belong only to the term defined, as we do also in the case of a property, or that the genus rendered in the definition is not the true genus, or that any of the things mentioned in the phrase used does not belong, as would be remarked also in the case of an accident, we shall have demolished the definition; so that, to use the phrase previously employed,' all the points we have enumerated might in a certain sense be called 'definitory'. But we must not on this account expect to find a single line of inquiry which will apply universally to them all: for this is not an easy thing to find, and, even were one found, it would be very obscure indeed, and of little service for the treatise before us. Rather, a special plan of inquiry must be laid down for each of the classes we have distinguished, and then, starting from the rules that are appropriate in each case, it will probably be easier to make our way right through the task before us. So then, as was said before,' we must outline a division of our subject, and other questions we must relegate each to the particular branch to which it most naturally belongs, speaking of them as 'definitory' and 'generic' questions. The questions I mean have practically been already assigned to their several branches.

7

First of all we must define the number of senses borne by the term 'Sameness'. Sameness would be generally regarded as falling, roughly speaking, into three divisions. We generally apply the term numerically or specifically or generically – numerically in cases where there is more than one name but only one thing, e.g. 'doublet' and 'cloak'; specifically, where there is more than one thing, but they present no differences in respect of their species, as one man and another, or one horse and another: for things like this that fall under the same species are said to be 'specifically the same'. Similarly, too, those things are called generically the same which fall under the same genus, such as a horse and a man. It might appear that the sense in which water from the same spring is called 'the same water' is somehow different and unlike the senses mentioned above: but really such a case as this ought to be ranked in the same class with the things that in one way or another are called 'the same' in view of unity of species. For all such things seem to be of one family and to resemble one another. For the reaon why all water is said to be specifically the same as all other water is because of a certain likeness it bears to it, and the only difference in the case of water drawn from the same spring is this, that the likeness is more emphatic: that is why we do not distinguish it from the things that in one way or another are called 'the same' in view of unity of species. It is generally supposed that the term 'the same' is most used in a sense agreed on by every one when applied to what is numerically one. But even so, it is apt to be rendered in more than one sense; its most literal and primary use is found whenever the sameness is rendered in reference to an alternative name or definition, as when a cloak is said to be the same as a doublet, or an animal that walks on two feet is said to be the same as a man: a second sense is when it is rendered in reference to a property, as when what can acquire knowledge is called the

same as a man, and what naturally travels upward the same as fire: while a third use is found when it is rendered in reference to some term drawn from Accident, as when the creature who is sitting, or who is musical, is called the same as Socrates. For all these uses mean to signify numerical unity. That what I have just said is true may be best seen where one form of appellation is substituted for another. For often when we give the order to call one of the people who are sitting down, indicating him by name, we change our description, whenever the person to whom we give the order happens not to understand us; he will, we think, understand better from some accidental feature; so we bid him call to us 'the man who is sitting' or 'who is conversing over there' – clearly supposing ourselves to be indicating the same object by its name and by its accident.

8

Of 'sameness' then, as has been said,' three senses are to be distinguished. Now one way to confirm that the elements mentioned above are those out of which and through which and to which arguments proceed, is by induction: for if any one were to survey propositions and problems one by one, it would be seen that each was formed either from the definition of something or from its property or from its genus or from its accident. Another way to confirm it is through reasoning. For every predicate of a subject must of necessity be either convertible with its subject or not: and if it is convertible, it would be its definition or property, for if it signifies the essence, it is the definition; if not, it is a property: for this was what a property is, viz. what is predicated convertibly, but does not signify the essence. If, on the other hand, it is not predicated convertibly of the thing, it either is or is not one of the terms

contained in the definition of the subject: and if it be one of those terms, then it will be the genus or the differentia, inasmuch as the definition consists of genus and differentiae; whereas, if it be not one of those terms, clearly it would be an accident, for accident was said' to be what belongs as an attribute to a subject without being either its definition or its genus or a property.

9

Next, then, we must distinguish between the classes of predicates in which the four orders in question are found. These are ten in number: Essence, Quantity, Quality, Relation, Place, Time, Position, State, Activity, Passivity. For the accident and genus and property and definition of anything will always be in one of these categories: for all the propositions found through these signify either something's essence or its quality or quantity or some one of the other types of predicate. It is clear, too, on the face of it that the man who signifies something's essence signifies sometimes a substance, sometimes a quality, sometimes some one of the other types of predicate. For when man is set before him and he says that what is set there is 'a man' or 'an animal', he states its essence and signifies a substance; but when a white colour is set before him and he says that what is set there is 'white' or is 'a colour', he states its essence and signifies a quality. Likewise, also, if a magnitude of a cubit be set before him and he says that what is set there is a magnitude of a cubit, he will be describing its essence and signifying a quantity. Likewise, also, in the other cases: for each of these kinds of predicate, if either it be asserted of itself, or its genus be asserted of it, signifies an essence: if, on the other hand, one kind of predicate is asserted of another kind, it does

not signify an essence, but a quantity or a quality or one of the other kinds of predicate. Such, then, and so many, are the subjects on which arguments take place, and the materials with which they start. How we are to acquire them, and by what means we are to become well supplied with them, falls next to be told.

10

First, then, a definition must be given of a 'dialectical proposition' and a 'dialectical problem'. For it is not every proposition nor yet every problem that is to be set down as dialectical: for no one in his senses would make a proposition of what no one holds, nor yet make a problem of what is obvious to everybody or to most people: for the latter admits of no doubt, while to the former no one would assent. Now a dialectical proposition consists in asking something that is held by all men or by most men or by the philosophers, i.e. either by all, or by most, or by the most notable of these, provided it be not contrary to the general opinion; for a man would probably assent to the view of the philosophers, if it be not contrary to the opinions of most men. Dialectical propositions also include views which are like those generally accepted; also propositions which contradict the contraries of opinions that are taken to be generally accepted, and also all opinions that are in accordance with the recognized arts. Thus, supposing it to be a general opinion that the knowledge of contraries is the same, it might probably pass for a general opinion also that the perception of contraries is the same: also, supposing it to be a general opinion that there is but one single science of grammar, it might pass for a general opinion that there is but one science of flute-playing as well, whereas, if it be a general opinion that there is

more than one science of grammar, it might pass for a general opinion that there is more than one science of flute-playing as well: for all these seem to be alike and akin. Likewise, also, propositions contradicting the contraries of general opinions will pass as general opinions: for if it be a general opinion that one ought to do good to one's friends, it will also be a general opinion that one ought not to do them harm. Here, that one ought to do harm to one's friends is contrary to the general view, and that one ought not to do them harm is the contradictory of that contrary. Likewise also, if one ought to do good to one's friends, one ought not to do good to one's enemies: this too is the contradictory of the view contrary to the general view; the contrary being that one ought to do good to one's enemies. Likewise, also, in other cases. Also, on comparison, it will look like a general opinion that the contrary predicate belongs to the contrary subject: e.g. if one ought to do good to one's friends, one ought also to do evil to one's enemies. it might appear also as if doing good to one's friends were a contrary to doing evil to one's enemies: but whether this is or is not so in reality as well will be stated in the course of the discussion upon contraries. Clearly also, all opinions that are in accordance with the arts are dialectical propositions; for people are likely to assent to the views held by those who have made a study of these things, e.g. on a question of medicine they will agree with the doctor, and on a question of geometry with the geometrician; and likewise also in other cases.

11

A dialectical problem is a subject of inquiry that contributes either to choice and avoidance, or to truth and knowledge, and that either by itself, or as a help to the solution of some other

such problem. It must, moreover, be something on which either people hold no opinion either way, or the masses hold a contrary opinion to the philosophers, or the philosophers to the masses, or each of them among themselves. For some problems it is useful to know with a view to choice or avoidance, e.g. whether pleasure is to be chosen or not, while some it is useful to know merely with a view to knowledge, e.g. whether the universe is eternal or not: others, again, are not useful in and by themselves for either of these purposes, but yet help us in regard to some such problems; for there are many things which we do not wish to know in and by themselves, but for the sake of other things, in order that through them we may come to know something else. Problems also include questions in regard to which reasonings conflict (the difficulty then being whether so – and so is so or not, there being convincing arguments for both views); others also in regard to which we have no argument because they are so vast, and we find it difficult to give our reasons, e.g. the question whether the universe is eternal or no: for into questions of that kind too it is possible to inquire.

Problems, then, and propositions are to be defined as aforesaid. A 'thesis' is a supposition of some eminent philosopher that conflicts with the general opinion; e.g. the view that contradiction is impossible, as Antisthenes said; or the view of Heraclitus that all things are in motion; or that Being is one, as Melissus says: for to take notice when any ordinary person expresses views contrary to men's usual opinions would be silly. Or it may be a view about which we have a reasoned theory contrary to men's usual opinions, e.g. the view maintained by the sophists that what is need not in every case either have come to be or be eternal: for a musician who is a grammarian 'is' so without ever having 'come to be' so, or being so eternally. For even if a man does not accept this view, he might do so on the ground that it is reasonable.

Now a ‘thesis’ also is a problem, though a problem is not always a thesis, inasmuch as some problems are such that we have no opinion about them either way. That a thesis, however, also forms a problem, is clear: for it follows of necessity from what has been said that either the mass of men disagree with the philosophers about the thesis, or that the one or the other class disagree among themselves, seeing that the thesis is a supposition in conflict with general opinion. Practically all dialectical problems indeed are now called ‘theses’. But it should make no difference whichever description is used; for our object in thus distinguishing them has not been to create a terminology, but to recognize what differences happen to be found between them.

Not every problem, nor every thesis, should be examined, but only one which might puzzle one of those who need argument, not punishment or perception. For people who are puzzled to know whether one ought to honour the gods and love one’s parents or not need punishment, while those who are puzzled to know whether snow is white or not need perception. The subjects should not border too closely upon the sphere of demonstration, nor yet be too far removed from it: for the former cases admit of no doubt, while the latter involve difficulties too great for the art of the trainer.

12

Having drawn these definitions, we must distinguish how many species there are of dialectical arguments. There is on the one hand Induction, on the other Reasoning. Now what reasoning is has been said before: induction is a passage from individuals to universals, e.g. the argument that supposing the skilled pilot is

the most effective, and likewise the skilled charioteer, then in general the skilled man is the best at his particular task. Induction is the more convincing and clear: it is more readily learnt by the use of the senses, and is applicable generally to the mass of men, though reasoning is more forcible and effective against contradictious people.

13

The classes, then, of things about which, and of things out of which, arguments are constructed, are to be distinguished in the way we have said before. The means whereby we are to become well supplied with reasonings are four: (1) the securing of propositions; (2) the power to distinguish in how many senses particular expression is used; (3) the discovery of the differences of things; (4) the investigation of likeness. The last three, as well, are in a certain sense propositions: for it is possible to make a proposition corresponding to each of them, e.g. (1) 'The desirable may mean either the honourable or the pleasant or the expedient'; and (2) Sensation differs from knowledge in that the latter may be recovered again after it has been lost, while the former cannot'; and (3) The relation of the healthy to health is like that of the vigorous to vigour'. The first proposition depends upon the use of one term in several senses, the second upon the differences of things, the third upon their likenesses.

14

Propositions should be selected in a number of ways corresponding to the number of distinctions drawn in regard to the proposition: thus one may first take in hand the opinions held by all or by most men or by the philosophers, i.e. by all, or most, or the most notable of them; or opinions contrary to those that seem to be generally held; and, again, all opinions that are in accordance with the arts. We must make propositions also of the contradictories of opinions contrary to those that seem to be generally held, as was laid down before. It is useful also to make them by selecting not only those opinions that actually are accepted, but also those that are like these, e.g. 'The perception of contraries is the same' – the knowledge of them being so – and 'we see by admission of something into ourselves, not by an emission'; for so it is, too, in the case of the other senses; for in hearing we admit something into ourselves; we do not emit; and we taste in the same way. Likewise also in the other cases. Moreover, all statements that seem to be true in all or in most cases, should be taken as a principle or accepted position; for they are posited by those who do not also see what exception there may be. We should select also from the written handbooks of argument, and should draw up sketch-lists of them upon each several kind of subject, putting them down under separate headings, e.g. 'On Good', or 'On Life' – and that 'On Good' should deal with every form of good, beginning with the category of essence. In the margin, too, one should indicate also the opinions of individual thinkers, e.g. 'Empedocles said that the elements of bodies were four': for any one might assent to the saying of some generally accepted authority.

Of propositions and problems there are – to comprehend the matter in outline – three divisions: for some are ethical propositions, some are on natural philosophy, while some are logical. Propositions such as the following are ethical, e.g.

‘Ought one rather to obey one’s parents or the laws, if they disagree?’; such as this are logical, e.g. ‘Is the knowledge of opposites the same or not?’; while such as this are on natural philosophy, e.g. ‘Is the universe eternal or not?’ Likewise also with problems. The nature of each of the aforesaid kinds of proposition is not easily rendered in a definition, but we have to try to recognize each of them by means of the familiarity attained through induction, examining them in the light of the illustrations given above.

For purposes of philosophy we must treat of these things according to their truth, but for dialectic only with an eye to general opinion. All propositions should be taken in their most universal form; then, the one should be made into many. E.g. ‘The knowledge of opposites is the same’; next, ‘The knowledge of contraries is the same’, and that ‘of relative terms’. In the same way these two should again be divided, as long as division is possible, e.g. the knowledge of ‘good and evil’, of ‘white and black’, or ‘cold and hot’. Likewise also in other cases.

15

On the formation, then, of propositions, the above remarks are enough. As regards the number of senses a term bears, we must not only treat of those terms which bear different senses, but we must also try to render their definitions; e.g. we must not merely say that justice and courage are called ‘good’ in one sense, and that what conduces to vigour and what conduces to health are called so in another, but also that the former are so called because of a certain intrinsic quality they themselves have, the latter because they are productive of a certain result

and not because of any intrinsic quality in themselves. Similarly also in other cases.

Whether a term bears a number of specific meanings or one only, may be considered by the following means. First, look and see if its contrary bears a number of meanings, whether the discrepancy between them be one of kind or one of names. For in some cases a difference is at once displayed even in the names; e.g. the contrary of 'sharp' in the case of a note is 'flat', while in the case of a solid edge it is 'dull'. Clearly, then, the contrary of 'sharp' bears several meanings, and if so, also does 'sharp'; for corresponding to each of the former terms the meaning of its contrary will be different. For 'sharp' will not be the same when contrary to 'dull' and to 'flat', though 'sharp' is the contrary of each. Again Barhu ('flat', 'heavy') in the case of a note has 'sharp' as its contrary, but in the case of a solid mass 'light', so that Barhu is used with a number of meanings, inasmuch as its contrary also is so used. Likewise, also, 'fine' as applied to a picture has 'ugly' as its contrary, but, as applied to a house, 'ramshackle'; so that 'fine' is an ambiguous term.

In some cases there is no discrepancy of any sort in the names used, but a difference of kind between the meanings is at once obvious: e.g. in the case of 'clear' and 'obscure': for sound is called 'clear' and 'obscure', just as 'colour' is too. As regards the names, then, there is no discrepancy, but the difference in kind between the meanings is at once obvious: for colour is not called 'clear' in a like sense to sound. This is plain also through sensation: for of things that are the same in kind we have the same sensation, whereas we do not judge clearness by the same sensation in the case of sound and of colour, but in the latter case we judge by sight, in the former by hearing. Likewise also with 'sharp' and 'dull' in regard to flavours and solid edges: here in the latter case we judge by touch, but in the former by taste. For here again there is no discrepancy in the names used, in the

case either of the original terms or of their contraries: for the contrary also of sharp in either sense is ‘dull’.

Moreover, see if one sense of a term has a contrary, while another has absolutely none; e.g. the pleasure of drinking has a contrary in the pain of thirst, whereas the pleasure of seeing that the diagonal is incommensurate with the side has none, so that ‘pleasure’ is used in more than one sense. To ‘love’ also, used of the frame of mind, has to ‘hate’ as its contrary, while as used of the physical activity (kissing) it has none: clearly, therefore, to ‘love’ is an ambiguous term. Further, see in regard to their intermediates, if some meanings and their contraries have an intermediate, others have none, or if both have one but not the same one, e.g. ‘clear’ and ‘obscure’ in the case of colours have ‘grey’ as an intermediate, whereas in the case of sound they have none, or, if they have, it is ‘harsh’, as some people say that a harsh sound is intermediate. ‘Clear’, then, is an ambiguous term, and likewise also ‘obscure’. See, moreover, if some of them have more than one intermediate, while others have but one, as is the case with ‘clear’ and ‘obscure’, for in the case of colours there are numbers of intermediates, whereas in regard to sound there is but one, viz. ‘harsh’.

Again, in the case of the contradictory opposite, look and see if it bears more than one meaning. For if this bears more than one meaning, then the opposite of it also will be used in more than one meaning; e.g. ‘to fail to see’ a phrase with more than one meaning, viz. (1) to fail to possess the power of sight, (2) to fail to put that power to active use. But if this has more than one meaning, it follows necessarily that ‘to see’ also has more than one meaning: for there will be an opposite to each sense of ‘to fail to see’; e.g. the opposite of ‘not to possess the power of sight’ is to possess it, while of ‘not to put the power of sight to active use’, the opposite is to put it to active use.

Moreover, examine the case of terms that denote the privation or presence of a certain state: for if the one term bears more than one meaning, then so will the remaining term: e.g. if 'to have sense' be used with more than one meaning, as applied to the soul and to the body, then 'to be wanting in sense' too will be used with more than one meaning, as applied to the soul and to the body. That the opposition between the terms now in question depends upon the privation or presence of a certain state is clear, since animals naturally possess each kind of 'sense', both as applied to the soul and as applied to the body.

Moreover, examine the inflected forms. For if 'justly' has more than one meaning, then 'just', also, will be used with more than one meaning; for there will be a meaning of 'just' to each of the meanings of 'justly'; e.g. if the word 'justly' be used of judging according to one's own opinion, and also of judging as one ought, then 'just' also will be used in like manner. In the same way also, if 'healthy' has more than one meaning, then 'healthily' also will be used with more than one meaning: e.g. if 'healthy' describes both what produces health and what preserves health and what betokens health, then 'healthily' also will be used to mean 'in such a way as to produce' or 'preserve' or 'betoken' health. Likewise also in other cases, whenever the original term bears more than one meaning, the inflexion also that is formed from it will be used with more than one meaning, and vice versa.

Look also at the classes of the predicates signified by the term, and see if they are the same in all cases. For if they are not the same, then clearly the term is ambiguous: e.g. 'good' in the case of food means 'productive of pleasure', and in the case of medicine 'productive of health', whereas as applied to the soul it means to be of a certain quality, e.g. temperate or courageous or just: and likewise also, as applied to 'man'. Sometimes it signifies what happens at a certain time, as (e.g.) the good that

happens at the right time: for what happens at the right time is called good. Often it signifies what is of certain quantity, e.g. as applied to the proper amount: for the proper amount too is called good. So then the term 'good' is ambiguous. In the same way also 'clear', as applied to a body, signifies a colour, but in regard to a note it denotes what is 'easy to hear'. 'Sharp', too, is in a closely similar case: for the same term does not bear the same meaning in all its applications: for a sharp note is a swift note, as the mathematical theorists of harmony tell us, whereas a sharp (acute) angle is one that is less than a right angle, while a sharp dagger is one containing a sharp angle (point).

Look also at the genera of the objects denoted by the same term, and see if they are different without being subaltern, as (e.g.) 'donkey', which denotes both the animal and the engine. For the definition of them that corresponds to the name is different: for the one will be declared to be an animal of a certain kind, and the other to be an engine of a certain kind. If, however, the genera be subaltern, there is no necessity for the definitions to be different. Thus (e.g.) 'animal' is the genus of 'raven', and so is 'bird'. Whenever therefore we say that the raven is a bird, we also say that it is a certain kind of animal, so that both the genera are predicated of it. Likewise also whenever we call the raven a 'flying biped animal', we declare it to be a bird: in this way, then, as well, both the genera are predicated of raven, and also their definition. But in the case of genera that are not subaltern this does not happen, for whenever we call a thing an 'engine', we do not call it an animal, nor vice versa.

Look also and see not only if the genera of the term before you are different without being subaltern, but also in the case of its contrary: for if its contrary bears several senses, clearly the term before you does so as well.

It is useful also to look at the definition that arises from the use of the term in combination, e.g. of a ‘clear (lit. white) body’ of a ‘clear note’. For then if what is peculiar in each case be abstracted, the same expression ought to remain over. This does not happen in the case of ambiguous terms, e.g. in the cases just mentioned. For the former will be body possessing such and such a colour’, while the latter will be ‘a note easy to hear’. Abstract, then, ‘a body ‘and’ a note’, and the remainder in each case is not the same. It should, however, have been had the meaning of ‘clear’ in each case been synonymous.

Often in the actual definitions as well ambiguity creeps in unawares, and for this reason the definitions also should be examined. If (e.g.) any one describes what betokens and what produces health as ‘related commensurably to health’, we must not desist but go on to examine in what sense he has used the term ‘commensurably’ in each case, e.g. if in the latter case it means that ‘it is of the right amount to produce health’, whereas in the for it means that ‘it is such as to betoken what kind of state prevails’.

Moreover, see if the terms cannot be compared as ‘more or less’ or as ‘in like manner’, as is the case (e.g.) with a ‘clear’ (lit. white) sound and a ‘clear’ garment, and a ‘sharp’ flavour and a ‘sharp’ note. For neither are these things said to be clear or sharp ‘in a like degree’, nor yet is the one said to be clearer or sharper than the other. ‘Clear’, then, and ‘sharp’ are ambiguous. For synonyms are always comparable; for they will always be used either in like manner, or else in a greater degree in one case.

Now since of genera that are different without being subaltern the differentiae also are different in kind, e.g. those of ‘animal’ and ‘knowledge’ (for the differentiae of these are different), look and see if the meanings comprised under the same term are

differentiae of genera that are different without being subaltern, as e.g. ‘sharp’ is of a ‘note’ and a ‘solid’. For being ‘sharp’ differentiates note from note, and likewise also one solid from another. ‘Sharp’, then, is an ambiguous term: for it forms differentiae of genera that are different without being subaltern.

Again, see if the actual meanings included under the same term themselves have different differentiae, e.g. ‘colour’ in bodies and ‘colour’ in tunes: for the differentiae of ‘colour’ in bodies are ‘sight-piercing’ and ‘sight compressing’, whereas ‘colour’ in melodies has not the same differentiae. Colour, then, is an ambiguous term; for things that are the same have the same differentiae.

Moreover, since the species is never the differentia of anything, look and see if one of the meanings included under the same term be a species and another a differentia, as (e.g.) clear’ (lit. white) as applied to a body is a species of colour, whereas in the case of a note it is a differentia; for one note is differentiated from another by being ‘clear’.

16

The presence, then, of a number of meanings in a term may be investigated by these and like means. The differences which things present to each other should be examined within the same genera, e.g. ‘Wherein does justice differ from courage, and wisdom from temperance?’ – for all these belong to the same genus; and also from one genus to another, provided they be not very much too far apart, e.g. ‘Wherein does sensation differ from knowledge?: for in the case of genera that are very far apart, the differences are entirely obvious.

17

Likeness should be studied, first, in the case of things belonging to different genera, the formulae being 'A:B = C:D' (e.g. as knowledge stands to the object of knowledge, so is sensation related to the object of sensation), and 'As A is in B, so is C in D' (e.g. as sight is in the eye, so is reason in the soul, and as is a calm in the sea, so is windlessness in the air). Practice is more especially needed in regard to terms that are far apart; for in the case of the rest, we shall be more easily able to see in one glance the points of likeness. We should also look at things which belong to the same genus, to see if any identical attribute belongs to them all, e.g. to a man and a horse and a dog; for in so far as they have any identical attribute, in so far they are alike.

18

It is useful to have examined the number of meanings of a term both for clearness' sake (for a man is more likely to know what it is he asserts, if it bas been made clear to him how many meanings it may have), and also with a view to ensuring that our reasonings shall be in accordance with the actual facts and not addressed merely to the term used. For as long as it is not clear in how many senses a term is used, it is possible that the answerer and the questioner are not directing their minds upon the same thing: whereas when once it has been made clear how many meanings there are, and also upon which of them the former directs his mind when he makes his assertion, the

questioner would then look ridiculous if he failed to address his argument to this. It helps us also both to avoid being misled and to mislead by false reasoning: for if we know the number of meanings of a term, we shall certainly never be misled by false reasoning, but shall know if the questioner fails to address his argument to the same point; and when we ourselves put the questions we shall be able to mislead him, if our answerer happens not to know the number of meanings of our terms. This, however, is not possible in all cases, but only when of the many senses some are true and others are false. This manner of argument, however, does not belong properly to dialectic; dialecticians should therefore by all means beware of this kind of verbal discussion, unless any one is absolutely unable to discuss the subject before him in any other way.

The discovery of the differences of things helps us both in reasonings about sameness and difference, and also in recognizing what any particular thing is. That it helps us in reasoning about sameness and difference is clear: for when we have discovered a difference of any kind whatever between the objects before us, we shall already have shown that they are not the same: while it helps us in recognizing what a thing is, because we usually distinguish the expression that is proper to the essence of each particular thing by means of the differentiae that are proper to it.

The examination of likeness is useful with a view both to inductive arguments and to hypothetical reasonings, and also with a view to the rendering of definitions. It is useful for inductive arguments, because it is by means of an induction of individuals in cases that are alike that we claim to bring the universal in evidence: for it is not easy to do this if we do not know the points of likeness. It is useful for hypothetical reasonings because it is a general opinion that among similars what is true of one is true also of the rest. If, then, with regard

to any of them we are well supplied with matter for a discussion, we shall secure a preliminary admission that however it is in these cases, so it is also in the case before us: then when we have shown the former we shall have shown, on the strength of the hypothesis, the matter before us as well: for we have first made the hypothesis that however it is in these cases, so it is also in the case before us, and have then proved the point as regards these cases. It is useful for the rendering of definitions because, if we are able to see in one glance what is the same in each individual case of it, we shall be at no loss into what genus we ought to put the object before us when we define it: for of the common predicates that which is most definitely in the category of essence is likely to be the genus. Likewise, also, in the case of objects widely divergent, the examination of likeness is useful for purposes of definition, e.g. the sameness of a calm at sea, and windlessness in the air (each being a form of rest), and of a point on a line and the unit in number – each being a starting point. If, then, we render as the genus what is common to all the cases, we shall get the credit of defining not inappropriately. Definition-mongers too nearly always render them in this way: they declare the unit to be the startingpoint of number, and the point the startingpoint of a line. It is clear, then, that they place them in that which is common to both as their genus.

The means, then, whereby reasonings are effected, are these: the commonplace rules, for the observance of which the aforesaid means are useful, are as follows.

Book II

1

Of problems some are universal, others particular. Universal problems are such as 'Every pleasure is good' and 'No pleasure is good'; particular problems are such as 'Some pleasure is good' and 'Some pleasure is not good'. The methods of establishing and overthrowing a view universally are common to both kinds of problems; for when we have shown that a predicate belongs in every case, we shall also have shown that it belongs in some cases. Likewise, also, if we show that it does not belong in any case, we shall also have shown that it does not belong in every case. First, then, we must speak of the methods of overthrowing a view universally, because such are common to both universal and particular problems, and because people more usually introduce theses asserting a predicate than denying it, while those who argue with them overthrow it. The conversion of an appropriate name which is drawn from the element 'accident' is an extremely precarious thing; for in the case of accidents and in no other it is possible for something to be true conditionally and not universally. Names drawn from the elements 'definition' and 'property' and 'genus' are bound to be convertible; e.g. if 'to be an animal that walks on two feet is an attribute of S', then it will be true by conversion to say that 'S is an animal that walks on two feet'. Likewise, also, if drawn from the genus; for if 'to be an animal is an attribute of S', then 'S is an animal'. The same is true also in the case of a property; for if 'to be capable of learning grammar is an attribute of S', then 'S will be capable of learning grammar'. For none of these attributes can possibly belong or not belong in part; they must either belong or not belong absolutely. In the case of accidents,

on the other hand, there is nothing to prevent an attribute (e.g. whiteness or justice) belonging in part, so that it is not enough to show that whiteness or justice is an attribute of a man in order to show that he is white or just; for it is open to dispute it and say that he is white or just in part only. Conversion, then, is not a necessary process in the case of accidents.

We must also define the errors that occur in problems. They are of two kinds, caused either by false statement or by transgression of the established diction. For those who make false statements, and say that an attribute belongs to thing which does not belong to it, commit error; and those who call objects by the names of other objects (e.g. calling a planetree a 'man') transgress the established terminology.

2

Now one commonplace rule is to look and see if a man has ascribed as an accident what belongs in some other way. This mistake is most commonly made in regard to the genera of things, e.g. if one were to say that white happens (accidit) to be a colour – for being a colour does not happen by accident to white, but colour is its genus. The assertor may of course define it so in so many words, saying (e.g.) that 'Justice happens (accidit) to be a virtue'; but often even without such definition it is obvious that he has rendered the genus as an accident; e.g. suppose that one were to say that whiteness is coloured or that walking is in motion. For a predicate drawn from the genus is never ascribed to the species in an inflected form, but always the genera are predicated of their species literally; for the species take on both the name and the definition of their genera. A man therefore who says that white is 'coloured' has

not rendered ‘coloured’ as its genus, seeing that he has used an inflected form, nor yet as its property or as its definition: for the definition and property of a thing belong to it and to nothing else, whereas many things besides white are coloured, e.g. a log, a stone, a man, and a horse. Clearly then he renders it as an accident.

Another rule is to examine all cases where a predicate has been either asserted or denied universally to belong to something. Look at them species by species, and not in their infinite multitude: for then the inquiry will proceed more directly and in fewer steps. You should look and begin with the most primary groups, and then proceed in order down to those that are not further divisible: e.g. if a man has said that the knowledge of opposites is the same, you should look and see whether it be so of relative opposites and of contraries and of terms signifying the privation or presence of certain states, and of contradictory terms. Then, if no clear result be reached so far in these cases, you should again divide these until you come to those that are not further divisible, and see (e.g.) whether it be so of just deeds and unjust, or of the double and the half, or of blindness and sight, or of being and not-being: for if in any case it be shown that the knowledge of them is not the same we shall have demolished the problem. Likewise, also, if the predicate belongs in no case. This rule is convertible for both destructive and constructive purposes: for if, when we have suggested a division, the predicate appears to hold in all or in a large number of cases, we may then claim that the other should actually assert it universally, or else bring a negative instance to show in what case it is not so: for if he does neither of these things, a refusal to assert it will make him look absurd.

Another rule is to make definitions both of an accident and of its subject, either of both separately or else of one of them, and then look and see if anything untrue has been assumed as true

in the definitions. Thus (e.g.) to see if it is possible to wrong a god, ask what is 'to wrong'? For if it be 'to injure deliberately', clearly it is not possible for a god to be wronged: for it is impossible that God should be injured. Again, to see if the good man is jealous, ask who is the 'jealous' man and what is 'jealousy'. For if 'jealousy' is pain at the apparent success of some well-behaved person, clearly the good man is not jealous: for then he would be bad. Again, to see if the indignant man is jealous, ask who each of them is: for then it will be obvious whether the statement is true or false; e.g. if he is 'jealous' who grieves at the successes of the good, and he is 'indignant' who grieves at the successes of the evil, then clearly the indignant man would not be jealous. A man should substitute definitions also for the terms contained in his definitions, and not stop until he comes to a familiar term: for often if the definition be rendered whole, the point at issue is not cleared up, whereas if for one of the terms used in the definition a definition be stated, it becomes obvious.

Moreover, a man should make the problem into a proposition for himself, and then bring a negative instance against it: for the negative instance will be a ground of attack upon the assertion. This rule is very nearly the same as the rule to look into cases where a predicate has been attributed or denied universally: but it differs in the turn of the argument.

Moreover, you should define what kind of things should be called as most men call them, and what should not. For this is useful both for establishing and for overthrowing a view: e.g. you should say that we ought to use our terms to mean the same things as most people mean by them, but when we ask what kind of things are or are not of such and such a kind, we should not here go with the multitude: e.g. it is right to call 'healthy' whatever tends to produce health, as do most men: but in saying whether the object before us tends to produce

health or not, we should adopt the language no longer of the multitude but of the doctor.

3

Moreover, if a term be used in several senses, and it has been laid down that it is or that it is not an attribute of S, you should show your case of one of its several senses, if you cannot show it of both. This rule is to be observed in cases where the difference of meaning is undetected; for supposing this to be obvious, then the other man will object that the point which he himself questioned has not been discussed, but only the other point. This commonplace rule is convertible for purposes both of establishing and of overthrowing a view. For if we want to establish a statement, we shall show that in one sense the attribute belongs, if we cannot show it of both senses: whereas if we are overthrowing a statement, we shall show that in one sense the attribute does not belong, if we cannot show it of both senses. Of course, in overthrowing a statement there is no need to start the discussion by securing any admission, either when the statement asserts or when it denies the attribute universally: for if we show that in any case whatever the attribute does not belong, we shall have demolished the universal assertion of it, and likewise also if we show that it belongs in a single case, we shall demolish the universal denial of it. Whereas in establishing a statement we ought to secure a preliminary admission that if it belongs in any case whatever, it belongs universally, supposing this claim to be a plausible one. For it is not enough to discuss a single instance in order to show that an attribute belongs universally; e.g. to argue that if the soul of man be immortal, then every soul is immortal, so that a previous admission must be secured that if any soul whatever

be immortal, then every soul is immortal. This is not to be done in every case, but only whenever we are not easily able to quote any single argument applying to all cases in common, as (e.g.) the geometrician can argue that the triangle has its angles equal to two right angles.

If, again, the variety of meanings of a term be obvious, distinguish how many meanings it has before proceeding either to demolish or to establish it: e.g. supposing 'the right' to mean 'the expedient' or 'the honourable', you should try either to establish or to demolish both descriptions of the subject in question; e.g. by showing that it is honourable and expedient, or that it is neither honourable nor expedient. Supposing, however, that it is impossible to show both, you should show the one, adding an indication that it is true in the one sense and not in the other. The same rule applies also when the number of senses into which it is divided is more than two.

Again, consider those expressions whose meanings are many, but differ not by way of ambiguity of a term, but in some other way: e.g. 'The science of many things is one': here 'many things' may mean the end and the means to that end, as (e.g.) medicine is the science both of producing health and of dieting; or they may be both of them ends, as the science of contraries is said to be the same (for of contraries the one is no more an end than the other); or again they may be an essential and an accidental attribute, as (e.g.) the essential fact that the triangle has its angles equal to two right angles, and the accidental fact that the equilateral figure has them so: for it is because of the accident of the equilateral triangle happening to be a triangle that we know that it has its angles equal to two right angles. If, then, it is not possible in any sense of the term that the science of many things should be the same, it clearly is altogether impossible that it should be so; or, if it is possible in some sense, then clearly it is possible. Distinguish as many meanings as are

required: e.g. if we want to establish a view, we should bring forward all such meanings as admit that view and should divide them only into those meanings which also are required for the establishment of our case: whereas if we want to overthrow a view, we should bring forward all that do not admit that view, and leave the rest aside. We must deal also in these cases as well with any uncertainty about the number of meanings involved. Further, that one thing is, or is not, 'of' another should be established by means of the same commonplace rules; e.g. that a particular science is of a particular thing, treated either as an end or as a means to its end, or as accidentally connected with it; or again that it is not 'of' it in any of the aforesaid ways. The same rule holds true also of desire and all other terms that have more than one object. For the 'desire of X' may mean the desire of it as an end (e.g. the desire of health) or as a means to an end (e.g. the desire of being doctored), or as a thing desired accidentally, as, in the case of wine, the sweet-toothed person desires it not because it is wine but because it is sweet. For essentially he desires the sweet, and only accidentally the wine: for if it be dry, he no longer desires it. His desire for it is therefore accidental. This rule is useful in dealing with relative terms: for cases of this kind are generally cases of relative terms.

4

Moreover, it is well to alter a term into one more familiar, e.g. to substitute 'clear' for 'exact' in describing a conception, and 'being fussy' for 'being busy': for when the expression is made more familiar, the thesis becomes easier to attack. This commonplace rule also is available for both purposes alike, both for establishing and for overthrowing a view.

In order to show that contrary attributes belong to the same thing, look at its genus; e.g. if we want to show that rightness and wrongness are possible in regard to perception, and to perceive is to judge, while it is possible to judge rightly or wrongly, then in regard to perception as well rightness and wrongness must be possible. In the present instance the proof proceeds from the genus and relates to the species: for 'to judge' is the genus of 'to perceive'; for the man who perceives judges in a certain way. But per contra it may proceed from the species to the genus: for all the attributes that belong to the species belong to the genus as well; e.g. if there is a bad and a good knowledge there is also a bad and a good disposition: for 'disposition' is the genus of knowledge. Now the former commonplace argument is fallacious for purposes of establishing a view, while the second is true. For there is no necessity that all the attributes that belong to the genus should belong also to the species; for 'animal' is flying and quadruped, but not so 'man'. All the attributes, on the other hand, that belong to the species must of necessity belong also to the genus; for if 'man' is good, then animal also is good. On the other hand, for purposes of overthrowing a view, the former argument is true while the latter is fallacious; for all the attributes which do not belong to the genus do not belong to the species either; whereas all those that are wanting to the species are not of necessity wanting to the genus.

Since those things of which the genus is predicated must also of necessity have one of its species predicated of them, and since those things that are possessed of the genus in question, or are described by terms derived from that genus, must also of necessity be possessed of one of its species or be described by terms derived from one of its species (e.g. if to anything the term 'scientific knowledge' be applied, then also there will be applied to it the term 'grammatical' or 'musical' knowledge, or knowledge of one of the other sciences; and if any one

possesses scientific knowledge or is described by a term derived from 'science', then he will also possess grammatical or musical knowledge or knowledge of one of the other sciences, or will be described by a term derived from one of them, e.g. as a 'grammarian' or a 'musician') – therefore if any expression be asserted that is in any way derived from the genus (e.g. that the soul is in motion), look and see whether it be possible for the soul to be moved with any of the species of motion; whether (e.g.) it can grow or be destroyed or come to be, and so forth with all the other species of motion. For if it be not moved in any of these ways, clearly it does not move at all. This commonplace rule is common for both purposes, both for overthrowing and for establishing a view: for if the soul moves with one of the species of motion, clearly it does move; while if it does not move with any of the species of motion, clearly it does not move.

If you are not well equipped with an argument against the assertion, look among the definitions, real or apparent, of the thing before you, and if one is not enough, draw upon several. For it will be easier to attack people when committed to a definition: for an attack is always more easily made on definitions.

Moreover, look and see in regard to the thing in question, what it is whose reality conditions the reality of the thing in question, or what it is whose reality necessarily follows if the thing in question be real: if you wish to establish a view inquire what there is on whose reality the reality of the thing in question will follow (for if the former be shown to be real, then the thing in question will also have been shown to be real); while if you want to overthrow a view, ask what it is that is real if the thing in question be real, for if we show that what follows from the thing in question is unreal, we shall have demolished the thing in question.

Moreover, look at the time involved, to see if there be any discrepancy anywhere: e.g. suppose a man to have stated that what is being nourished of necessity grows: for animals are always of necessity being nourished, but they do not always grow. Likewise, also, if he has said that knowing is remembering: for the one is concerned with past time, whereas the other has to do also with the present and the future. For we are said to know things present and future (e.g. that there will be an eclipse), whereas it is impossible to remember anything save what is in the past.

5

Moreover, there is the sophistic turn of argument, whereby we draw our opponent into the kind of statement against which we shall be well supplied with lines of argument. This process is sometimes a real necessity, sometimes an apparent necessity, sometimes neither an apparent nor a real necessity. It is really necessary whenever the answerer has denied any view that would be useful in attacking the thesis, and the questioner thereupon addresses his arguments to the support of this view, and when moreover the view in question happens to be one of a kind on which he has a good stock of lines of argument. Likewise, also, it is really necessary whenever he (the questioner) first, by an induction made by means of the view laid down, arrives at a certain statement and then tries to demolish that statement: for when once this has been demolished, the view originally laid down is demolished as well. It is an apparent necessity, when the point to which the discussion comes to be directed appears to be useful, and relevant to the thesis, without being really so; whether it be that the man who is standing up to the argument has refused to

concede something, or whether he (the questioner) has first reached it by a plausible induction based upon the thesis and then tries to demolish it. The remaining case is when the point to which the discussion comes to be directed is neither really nor apparently necessary, and it is the answerer's luck to be confuted on a mere side issue You should beware of the last of the aforesaid methods; for it appears to be wholly disconnected from, and foreign to, the art of dialectic. For this reason, moreover, the answerer should not lose his temper, but assent to those statements that are of no use in attacking the thesis, adding an indication whenever he assents although he does not agree with the view. For, as a rule, it increases the confusion of questioners if, after all propositions of this kind have been granted them, they can then draw no conclusion.

Moreover, any one who has made any statement whatever has in a certain sense made several statements, inasmuch as each statement has a number of necessary consequences: e.g. the man who said 'X is a man' has also said that it is an animal and that it is animate and a biped and capable of acquiring reason and knowledge, so that by the demolition of any single one of these consequences, of whatever kind, the original statement is demolished as well. But you should beware here too of making a change to a more difficult subject: for sometimes the consequence, and sometimes the original thesis, is the easier to demolish.

6

In regard to subjects which must have one and one only of two predicates, as (e.g.) a man must have either a disease or health, supposing we are well supplied as regards the one for arguing

its presence or absence, we shall be well equipped as regards the remaining one as well. This rule is convertible for both purposes: for when we have shown that the one attribute belongs, we shall have shown that the remaining one does not belong; while if we show that the one does not belong, we shall have shown that the remaining one does belong. Clearly then the rule is useful for both purposes.

Moreover, you may devise a line of attack by reinterpreting a term in its literal meaning, with the implication that it is most fitting so to take it rather than in its established meaning: e.g. the expression 'strong at heart' will suggest not the courageous man, according to the use now established, but the man the state of whose heart is strong; just as also the expression 'of a good hope' may be taken to mean the man who hopes for good things. Likewise also 'well-starred' may be taken to mean the man whose star is good, as Xenocrates says 'well-starred is he who has a noble soul'.' For a man's star is his soul.

Some things occur of necessity, others usually, others however it may chance; if therefore a necessary event has been asserted to occur usually, or if a usual event (or, failing such an event itself, its contrary) has been stated to occur of necessity, it always gives an opportunity for attack. For if a necessary event has been asserted to occur usually, clearly the speaker has denied an attribute to be universal which is universal, and so has made a mistake: and so he has if he has declared the usual attribute to be necessary: for then he declares it to belong universally when it does not so belong. Likewise also if he has declared the contrary of what is usual to be necessary. For the contrary of a usual attribute is always a comparatively rare attribute: e.g. if men are usually bad, they are comparatively seldom good, so that his mistake is even worse if he has declared them to be good of necessity. The same is true also if he has declared a mere matter of chance to happen of necessity or usually; for a

chance event happens neither of necessity nor usually. If the thing happens usually, then even supposing his statement does not distinguish whether he meant that it happens usually or that it happens necessarily, it is open to you to discuss it on the assumption that he meant that it happens necessarily: e.g. if he has stated without any distinction that disinherited persons are bad, you may assume in discussing it that he means that they are so necessarily.

Moreover, look and see also if he has stated a thing to be an accident of itself, taking it to be a different thing because it has a different name, as Prodicus used to divide pleasures into joy and delight and good cheer: for all these are names of the same thing, to wit, Pleasure. If then any one says that joyfulness is an accidental attribute of cheerfulness, he would be declaring it to be an accidental attribute of itself.

7

Inasmuch as contraries can be conjoined with each other in six ways, and four of these conjunctions constitute a contrariety, we must grasp the subject of contraries, in order that it may help us both in demolishing and in establishing a view. Well then, that the modes of conjunction are six is clear: for either (1) each of the contrary verbs will be conjoined to each of the contrary objects; and this gives two modes: e.g. to do good to friends and to do evil to enemies, or per contra to do evil to friends and to do good to enemies. Or else (2) both verbs may be attached to one object; and this too gives two modes, e.g. to do good to friends and to do evil to friends, or to do good to enemies and to do evil to enemies. Or (3) a single verb may be attached to both objects: and this also gives two modes; e.g. to

do good to friends and to do good to enemies, or to do evil to friends and evil to enemies.

The first two then of the aforesaid conjunctions do not constitute any contrariety; for the doing of good to friends is not contrary to the doing of evil to enemies: for both courses are desirable and belong to the same disposition. Nor is the doing of evil to friends contrary to the doing of good to enemies: for both of these are objectionable and belong to the same disposition: and one objectionable thing is not generally thought to be the contrary of another, unless the one be an expression denoting an excess, and the other an expression denoting a defect: for an excess is generally thought to belong to the class of objectionable things, and likewise also a defect. But the other four all constitute a contrariety. For to do good to friends is contrary to the doing of evil to friends: for it proceeds from the contrary disposition, and the one is desirable, and the other objectionable. The case is the same also in regard to the other conjunctions: for in each combination the one course is desirable, and the other objectionable, and the one belongs to a reasonable disposition and the other to a bad. Clearly, then, from what has been said, the same course has more than one contrary. For the doing of good to friends has as its contrary both the doing of good to enemies and the doing of evil to friends. Likewise, if we examine them in the same way, we shall find that the contraries of each of the others also are two in number. Select therefore whichever of the two contraries is useful in attacking the thesis.

Moreover, if the accident of a thing have a contrary, see whether it belongs to the subject to which the accident in question has been declared to belong: for if the latter belongs the former could not belong; for it is impossible that contrary predicates should belong at the same time to the same thing.

Or again, look and see if anything has been said about something, of such a kind that if it be true, contrary predicates must necessarily belong to the thing: e.g. if he has said that the 'Ideas' exist in us. For then the result will be that they are both in motion and at rest, and moreover that they are objects both of sensation and of thought. For according to the views of those who posit the existence of Ideas, those Ideas are at rest and are objects of thought; while if they exist in us, it is impossible that they should be unmoved: for when we move, it follows necessarily that all that is in us moves with us as well. Clearly also they are objects of sensation, if they exist in us: for it is through the sensation of sight that we recognize the Form present in each individual.

Again, if there be posited an accident which has a contrary, look and see if that which admits of the accident will admit of its contrary as well: for the same thing admits of contraries. Thus (e.g.) if he has asserted that hatred follows anger, hatred would in that case be in the 'spirited faculty': for that is where anger is. You should therefore look and see if its contrary, to wit, friendship, be also in the 'spirited faculty': for if not – if friendship is in the faculty of desire – then hatred could not follow anger. Likewise also if he has asserted that the faculty of desire is ignorant. For if it were capable of ignorance, it would be capable of knowledge as well: and this is not generally held – I mean that the faculty of desire is capable of knowledge. For purposes, then, of overthrowing a view, as has been said, this rule should be observed: but for purposes of establishing one, though the rule will not help you to assert that the accident actually belongs, it will help you to assert that it may possibly belong. For having shown that the thing in question will not admit of the contrary of the accident asserted, we shall have shown that the accident neither belongs nor can possibly belong; while on the other hand, if we show that the contrary belongs, or that the thing is capable of the contrary, we shall not

indeed as yet have shown that the accident asserted does belong as well; our proof will merely have gone to this point, that it is possible for it to belong.

8

Seeing that the modes of opposition are four in number, you should look for arguments among the contradictories of your terms, converting the order of their sequence, both when demolishing and when establishing a view, and you should secure them by means of induction – such arguments (e.g.) as that man be an animal, what is not an animal is not a man': and likewise also in other instances of contradictories. For in those cases the sequence is converse: for 'animal' follows upon 'man but 'not-animal' does not follow upon 'not-man', but conversely 'not-man' upon 'not-animal'. In all cases, therefore, a postulate of this sort should be made, (e.g.) that 'If the honourable is pleasant, what is not pleasant is not honourable, while if the latter be untrue, so is the former'. Likewise, also, 'If what is not pleasant be not honourable, then what is honourable is pleasant'. Clearly, then, the conversion of the sequence formed by contradiction of the terms of the thesis is a method convertible for both purposes.

Then look also at the case of the contraries of S and P in the thesis, and see if the contrary of the one follows upon the contrary of the other, either directly or conversely, both when you are demolishing and when you are establishing a view: secure arguments of this kind as well by means of induction, so far as may be required. Now the sequence is direct in a case such as that of courage and cowardice: for upon the one of them virtue follows, and vice upon the other; and upon the one

it follows that it is desirable, while upon the other it follows that it is objectionable. The sequence, therefore, in the latter case also is direct; for the desirable is the contrary of the objectionable. Likewise also in other cases. The sequence is, on the other hand, converse in such a case as this: Health follows upon vigour, but disease does not follow upon debility; rather debility follows upon disease. In this case, then, clearly the sequence is converse. Converse sequence is, however, rare in the case of contraries; usually the sequence is direct. If, therefore, the contrary of the one term does not follow upon the contrary of the other either directly or conversely, clearly neither does the one term follow upon the other in the statement made: whereas if the one followed the other in the case of the contraries, it must of necessity do so as well in the original statement.

You should look also into cases of the privation or presence of a state in like manner to the case of contraries. Only, in the case of such privations the converse sequence does not occur: the sequence is always bound to be direct: e.g. as sensation follows sight, while absence of sensation follows blindness. For the opposition of sensation to absence of sensation is an opposition of the presence to the privation of a state: for the one of them is a state, and the other the privation of it.

The case of relative terms should also be studied in like manner to that of a state and its privation: for the sequence of these as well is direct; e.g. if 3/1 is a multiple, then 1/3 is a fraction: for 3/1 is relative to 1/3, and so is a multiple to a fraction. Again, if knowledge be a conceiving, then also the object of knowledge is an object of conception; and if sight be a sensation, then also the object of sight is an object of sensation. An objection may be made that there is no necessity for the sequence to take place, in the case of relative terms, in the way described: for the object of sensation is an object of knowledge, whereas sensation is not

knowledge. The objection is, however, not generally received as really true; for many people deny that there is knowledge of objects of sensation. Moreover, the principle stated is just as useful for the contrary purpose, e.g. to show that the object of sensation is not an object of knowledge, on the ground that neither is sensation knowledge.

9

Again look at the case of the co-ordinates and inflected forms of the terms in the thesis, both in demolishing and in establishing it. By co-ordinates' are meant terms such as the following: 'Just deeds' and the 'just man' are coordinates of 'justice', and 'courageous deeds' and the 'courageous man' are co-ordinates of courage. Likewise also things that tend to produce and to preserve anything are called co-ordinates of that which they tend to produce and to preserve, as e.g. 'healthy habits' are co-ordinates of 'health' and a 'vigorous constitutional' of a 'vigorous constitution' and so forth also in other cases. 'Co-ordinate', then, usually describes cases such as these, whereas 'inflected forms' are such as the following: 'justly', 'courageously', 'healthily', and such as are formed in this way. It is usually held that words when used in their inflected forms as well are co-ordinates, as (e.g.) 'justly' in relation to justice, and 'courageously' to courage; and then 'co-ordinate' describes all the members of the same kindred series, e.g. 'justice', 'just', of a man or an act, 'justly'. Clearly, then, when any one member, whatever its kind, of the same kindred series is shown to be good or praiseworthy, then all the rest as well come to be shown to be so: e.g. if 'justice' be something praiseworthy, then so will 'just', of a man or thing, and 'justly' connote something praiseworthy. Then 'justly' will be rendered also 'praiseworthily',

derived will by the same inflexion from 'the praiseworthy' whereby 'justly' is derived from 'justice'.

Look not only in the case of the subject mentioned, but also in the case of its contrary, for the contrary predicate: e.g. argue that good is not necessarily pleasant; for neither is evil painful: or that, if the latter be the case, so is the former. Also, if justice be knowledge, then injustice is ignorance: and if 'justly' means 'knowingly' and 'skilfully', then 'unjustly' means 'ignorantly' and 'unskilfully': whereas if the latter be not true, neither is the former, as in the instance given just now: for 'unjustly' is more likely to seem equivalent to 'skilfully' than to 'unskilfully'. This commonplace rule has been stated before in dealing with the sequence of contraries; for all we are claiming now is that the contrary of P shall follow the contrary of S.

Moreover, look at the modes of generation and destruction of a thing, and at the things which tend to produce or to destroy it, both in demolishing and in establishing a view. For those things whose modes of generation rank among good things, are themselves also good; and if they themselves be good, so also are their modes of generation. If, on the other hand, their modes of generation be evil, then they themselves also are evil. In regard to modes of destruction the converse is true: for if the modes of destruction rank as good things, then they themselves rank as evil things; whereas if the modes of destruction count as evil, they themselves count as good. The same argument applies also to things tending to produce and destroy: for things whose productive causes are good, themselves also rank as good; whereas if causes destructive of them are good, they themselves rank as evil.

10

Again, look at things which are like the subject in question, and see if they are in like case; e.g. if one branch of knowledge has more than one object, so also will one opinion; and if to possess sight be to see, then also to possess hearing will be to hear. Likewise also in the case of other things, both those which are and those which are generally held to be like. The rule in question is useful for both purposes; for if it be as stated in the case of some one like thing, it is so with the other like things as well, whereas if it be not so in the case of some one of them, neither is it so in the case of the others. Look and see also whether the cases are alike as regards a single thing and a number of things: for sometimes there is a discrepancy. Thus, if to 'know' a thing be to 'think of' it, then also to 'know many things' is to 'be thinking of many things'; whereas this is not true; for it is possible to know many things but not to be thinking of them. If, then, the latter proposition be not true, neither was the former that dealt with a single thing, viz. that to 'know' a thing is to 'think of' it.

Moreover, argue from greater and less degrees. In regard to greater degrees there are four commonplace rules. One is: See whether a greater degree of the predicate follows a greater degree of the subject: e.g. if pleasure be good, see whether also a greater pleasure be a greater good: and if to do a wrong be evil, see whether also to do a greater wrong is a greater evil. Now this rule is of use for both purposes: for if an increase of the accident follows an increase of the subject, as we have said, clearly the accident belongs; while if it does not follow, the accident does not belong. You should establish this by induction. Another rule is: If one predicate be attributed to two subjects; then supposing it does not belong to the subject to which it is the more likely to belong, neither does it belong where it is less likely to belong; while if it does belong where it

is less likely to belong, then it belongs as well where it is more likely. Again: If two predicates be attributed to one subject, then if the one which is more generally thought to belong does not belong, neither does the one that is less generally thought to belong; or, if the one that is less generally thought to belong does belong, so also does the other. Moreover: If two predicates be attributed to two subjects, then if the one which is more usually thought to belong to the one subject does not belong, neither does the remaining predicate belong to the remaining subject; or, if the one which is less usually thought to belong to the one subject does belong, so too does the remaining predicate to the remaining subject.

Moreover, you can argue from the fact that an attribute belongs, or is generally supposed to belong, in a like degree, in three ways, viz. those described in the last three rules given in regard to a greater degree.' For supposing that one predicate belongs, or is supposed to belong, to two subjects in a like degree, then if it does not belong to the one, neither does it belong to the other; while if it belongs to the one, it belongs to the remaining one as well. Or, supposing two predicates to belong in a like degree to the same subject, then, if the one does not belong, neither does the remaining one; while if the one does belong, the remaining one belongs as well. The case is the same also if two predicates belong in a like degree to two subjects; for if the one predicate does not belong to the one subject, neither does the remaining predicate belong to the remaining subject, while if the one predicate does belong to the one subject, the remaining predicate belongs to the remaining subject as well.

11

You can argue, then, from greater or less or like degrees of truth in the aforesaid number of ways. Moreover, you should argue from the addition of one thing to another. If the addition of one thing to another makes that other good or white, whereas formerly it was not white or good, then the thing added will be white or good – it will possess the character it imparts to the whole as well. Moreover, if an addition of something to a given object intensifies the character which it had as given, then the thing added will itself as well be of that character. Likewise, also, in the case of other attributes. The rule is not applicable in all cases, but only in those in which the excess described as an 'increased intensity' is found to take place. The above rule is, however, not convertible for overthrowing a view. For if the thing added does not make the other good, it is not thereby made clear whether in itself it may not be good: for the addition of good to evil does not necessarily make the whole good, any more than the addition of white to black makes the whole white.

Again, any predicate of which we can speak of greater or less degrees belongs also absolutely: for greater or less degrees of good or of white will not be attributed to what is not good or white: for a bad thing will never be said to have a greater or less degree of goodness than another, but always of badness. This rule is not convertible, either, for the purpose of overthrowing a predication: for several predicates of which we cannot speak of a greater degree belong absolutely: for the term 'man' is not attributed in greater and less degrees, but a man is a man for all that.

You should examine in the same way predicates attributed in a given respect, and at a given time and place: for if the predicate be possible in some respect, it is possible also absolutely.

Likewise, also, is what is predicated at a given time or place: for what is absolutely impossible is not possible either in any respect or at any place or time. An objection may be raised that in a given respect people may be good by nature, e.g. they may be generous or temperately inclined, while absolutely they are not good by nature, because no one is prudent by nature. Likewise, also, it is possible for a destructible thing to escape destruction at a given time, whereas it is not possible for it to escape absolutely. In the same way also it is a good thing at certain places to follow see and such a diet, e.g. in infected areas, though it is not a good thing absolutely. Moreover, in certain places it is possible to live singly and alone, but absolutely it is not possible to exist singly and alone. In the same way also it is in certain places honourable to sacrifice one's father, e.g. among the Triballi, whereas, absolutely, it is not honourable. Or possibly this may indicate a relativity not to places but to persons: for it is all the same wherever they may be: for everywhere it will be held honourable among the Triballi themselves, just because they are Triballi. Again, at certain times it is a good thing to take medicines, e.g. when one is ill, but it is not so absolutely. Or possibly this again may indicate a relativity not to a certain time, but to a certain state of health: for it is all the same whenever it occurs, if only one be in that state. A thing is 'absolutely' so which without any addition you are prepared to say is honourable or the contrary. Thus (e.g.) you will deny that to sacrifice one's father is honourable: it is honourable only to certain persons: it is not therefore honourable absolutely. On the other hand, to honour the gods you will declare to be honourable without adding anything, because that is honourable absolutely. So that whatever without any addition is generally accounted to be honourable or dishonourable or anything else of that kind, will be said to be so 'absolutely'.

Book III

1

The question which is the more desirable, or the better, of two or more things, should be examined upon the following lines: only first of all it must be clearly laid down that the inquiry we are making concerns not things that are widely divergent and that exhibit great differences from one another (for nobody raises any doubt whether happiness or wealth is more desirable), but things that are nearly related and about which we commonly discuss for which of the two we ought rather to vote, because we do not see any advantage on either side as compared with the other. Clearly, in such cases if we can show a single advantage, or more than one, our judgement will record our assent that whichever side happens to have the advantage is the more desirable.

First, then, that which is more lasting or secure is more desirable than that which is less so: and so is that which is more likely to be chosen by the prudent or by the good man or by the right law, or by men who are good in any particular line, when they make their choice as such, or by the experts in regard to any particular class of things; i.e. either whatever most of them or what all of them would choose; e.g. in medicine or in carpentry those things are more desirable which most, or all, doctors would choose; or, in general, whatever most men or all men or all things would choose, e.g. the good: for everything aims at the good. You should direct the argument you intend to

employ to whatever purpose you require. Of what is 'better' or 'more desirable' the absolute standard is the verdict of the better science, though relatively to a given individual the standard may be his own particular science.

In the second place, that which is known as 'an x' is more desirable than that which does not come within the genus 'x' – e.g. justice than a just man; for the former falls within the genus 'good', whereas the other does not, and the former is called 'a good', whereas the latter is not: for nothing which does not happen to belong to the genus in question is called by the generic name; e.g. a 'white man' is not 'a colour'. Likewise also in other cases.

Also, that which is desired for itself is more desirable than that which is desired for something else; e.g. health is more desirable than gymnastics: for the former is desired for itself, the latter for something else. Also, that which is desirable in itself is more desirable than what is desirable per accidens; e.g. justice in our friends than justice in our enemies: for the former is desirable in itself, the latter per accidens: for we desire that our enemies should be just per accidens, in order that they may do us no harm. This last principle is the same as the one that precedes it, with, however, a different turn of expression. For we desire justice in our friends for itself, even though it will make no difference to us, and even though they be in India; whereas in our enemies we desire it for something else, in order that they may do us no harm.

Also, that which is in itself the cause of good is more desirable than what is so per accidens, e.g. virtue than luck (for the former in itself, and the latter per accidens, the cause of good things), and so in other cases of the same kind. Likewise also in the case of the contrary; for what is in itself the cause of evil is more objectionable than what is so per accidens, e.g. vice and

chance: for the one is bad in itself, whereas chance is so per accidens.

Also, what is good absolutely is more desirable than what is good for a particular person, e.g. recovery of health than a surgical operation; for the former is good absolutely, the latter only for a particular person, viz. the man who needs an operation. So too what is good by nature is more desirable than the good that is not so by nature, e.g. justice than the just man; for the one is good by nature, whereas in the other case the goodness is acquired. Also the attribute is more desirable which belongs to the better and more honourable subject, e.g. to a god rather than to a man, and to the soul rather than to the body. So too the property of the better thing is better than the property of the worse; e.g. the property of God than the property of man: for whereas in respect of what is common in both of them they do not differ at all from each other, in respect of their properties the one surpasses the other. Also that is better which is inherent in things better or prior or more honourable: thus (e.g.) health is better than strength and beauty: for the former is inherent in the moist and the dry, and the hot and the cold, in fact in all the primary constituents of an animal, whereas the others are inherent in what is secondary, strength being a feature of the sinews and bones, while beauty is generally supposed to consist in a certain symmetry of the limbs. Also the end is generally supposed to be more desirable than the means, and of two means, that which lies nearer the end. In general, too, a means directed towards the end of life is more desirable than a means to anything else, e.g. that which contributes to happiness than that which contributes to prudence. Also the competent is more desirable than the incompetent. Moreover, of two productive agents that one is more desirable whose end is better; while between a productive agent and an end we can decide by a proportional sum whenever the excess of the one end over the other is greater than that of the latter over its own

productive means: e.g. supposing the excess of happiness over health to be greater than that of health over what produces health, then what produces happiness is better than health. For what produces happiness exceeds what produces health just as much as happiness exceeds health. But health exceeds what produces health by a smaller amount; ergo, the excess of what produces happiness over what produces health is greater than that of health over what produces health. Clearly, therefore, what produces happiness is more desirable than health: for it exceeds the same standard by a greater amount. Moreover, what is in itself nobler and more precious and praiseworthy is more desirable than what is less so, e.g. friendship than wealth, and justice than strength. For the former belong in themselves to the class of things precious and praiseworthy, while the latter do so not in themselves but for something else: for no one prizes wealth for itself but always for something else, whereas we prize friendship for itself, even though nothing else is likely to come to us from it.

2

Moreover, whenever two things are very much like one another, and we cannot see any superiority in the one over the other of them, we should look at them from the standpoint of their consequences. For the one which is followed by the greater good is the more desirable: or, if the consequences be evil, that is more desirable which is followed by the less evil. For though both may be desirable, yet there may possibly be some unpleasant consequence involved to turn the scale. Our survey from the point of view of consequences lies in two directions, for there are prior consequences and later consequences: e.g. if a man learns, it follows that he was ignorant before and knows

afterwards. As a rule, the later consequence is the better to consider. You should take, therefore, whichever of the consequences suits your purpose.

Moreover, a greater number of good things is more desirable than a smaller, either absolutely or when the one is included in the other, viz. the smaller number in the greater. An objection may be raised suppose in some particular case the one is valued for the sake of the other; for then the two together are not more desirable than the one; e.g. recovery of health and health, than health alone, inasmuch as we desire recovery of health for the sake of health. Also it is quite possible for what is not good, together with what is, to be more desirable than a greater number of good things, e.g. the combination of happiness and something else which is not good may be more desirable than the combination of justice and courage. Also, the same things are more valuable if accompanied than if unaccompanied by pleasure, and likewise when free from pain than when attended with pain.

Also, everything is more desirable at the season when it is of greater consequence; e.g. freedom from pain in old age more than in youth: for it is of greater consequence in old age. On the same principle also, prudence is more desirable in old age; for no man chooses the young to guide him, because he does not expect them to be prudent. With courage, the converse is the case, for it is in youth that the active exercise of courage is more imperatively required. Likewise also with temperance; for the young are more troubled by their passions than are their elders.

Also, that is more desirable which is more useful at every season or at most seasons, e.g. justice and temperance rather than courage: for they are always useful, while courage is only useful at times. Also, that one of two things which if all possess, we do not need the other thing, is more desirable than that

which all may possess and still we want the other one as well. Take the case of justice and courage; if everybody were just, there would be no use for courage, whereas all might be courageous, and still justice would be of use.

Moreover, judge by the destructions and losses and generations and acquisitions and contraries of things: for things whose destruction is more objectionable are themselves more desirable. Likewise also with the losses and contraries of things; for a thing whose loss or whose contrary is more objectionable is itself more desirable. With the generations or acquisitions of things the opposite is the case: for things whose acquisition or generation is more desirable are themselves also desirable. Another commonplace rule is that what is nearer to the good is better and more desirable, i.e. what more nearly resembles the good: thus justice is better than a just man. Also, that which is more like than another thing to something better than itself, as e.g. some say that Ajax was a better man than Odysseus because he was more like Achilles. An objection may be raised to this that it is not true: for it is quite possible that Ajax did not resemble Achilles more nearly than Odysseus in the points which made Achilles the best of them, and that Odysseus was a good man, though unlike Achilles. Look also to see whether the resemblance be that of a caricature, like the resemblance of a monkey to a man, whereas a horse bears none: for the monkey is not the more handsome creature, despite its nearer resemblance to a man. Again, in the case of two things, if one is more like the better thing while another is more like the worse, then that is likely to be better which is more like the better. This too, however, admits of an objection: for quite possibly the one only slightly resembles the better, while the other strongly resembles the worse, e.g. supposing the resemblance of Ajax to Achilles to be slight, while that of Odysseus to Nestor is strong. Also it may be that the one which is like the better type shows a degrading likeness, whereas the one which is like the worse

type improves upon it: witness the likeness of a horse to a donkey, and that of a monkey to a man.

Another rule is that the more conspicuous good is more desirable than the less conspicuous, and the more difficult than the easier: for we appreciate better the possession of things that cannot be easily acquired. Also the more personal possession is more desirable than the more widely shared. Also, that which is more free from connexion with evil: for what is not attended by any unpleasantness is more desirable than what is so attended.

Moreover, if A be without qualification better than B, then also the best of the members of A is better than the best of the members of B; e.g. if Man be better than Horse, then also the best man is better than the best horse. Also, if the best in A be better than the best in B, then also A is better than B without qualification; e.g. if the best man be better than the best horse, then also Man is better than Horse without qualification.

Moreover, things which our friends can share are more desirable than those they cannot. Also, things which we like rather to do to our friend are more desirable than those we like to do to the man in the street, e.g. just dealing and the doing of good rather than the semblance of them: for we would rather really do good to our friends than seem to do so, whereas towards the man in the street the converse is the case.

Also, superfluities are better than necessities, and are sometimes more desirable as well: for the good life is better than mere life, and good life is a superfluity, whereas mere life itself is a necessity. Sometimes, though, what is better is not also more desirable: for there is no necessity that because it is better it should also be more desirable: at least to be a philosopher is better than to make money, but it is not more desirable for a man who lacks the necessities of life. The expression 'superfluity' applies whenever a man possesses the

necessities of life and sets to work to secure as well other noble acquisitions. Roughly speaking, perhaps, necessities are more desirable, while superfluities are better.

Also, what cannot be got from another is more desirable than what can be got from another as well, as (e.g.) is the case of justice compared with courage. Also, A is more desirable if A is desirable without B, but not B without A: power (e.g.) is not desirable without prudence, but prudence is desirable without power. Also, if of two things we repudiate the one in order to be thought to possess the other, then that one is more desirable which we wish to be thought to possess; thus (e.g.) we repudiate the love of hard work in order that people may think us geniuses.

Moreover, that is more desirable in whose absence it is less blameworthy for people to be vexed; and that is more desirable in whose absence it is more blameworthy for a man not to be vexed.

3

Moreover, of things that belong to the same species one which possesses the peculiar virtue of the species is more desirable than one which does not. If both possess it, then the one which possesses it in a greater degree is more desirable.

Moreover, if one thing makes good whatever it touches, while another does not, the former is more desirable, just as also what makes things warm is warmer than what does not. If both do so, then that one is more desirable which does so in a greater degree, or if it render good the better and more important object – if (e.g.), the one makes good the soul, and the other the body.

Moreover, judge things by their inflexions and uses and actions and works, and judge these by them: for they go with each other: e.g. if 'justly' means something more desirable than 'courageously', then also justice means something more desirable than courage; and if justice be more desirable than courage, then also 'justly' means something more desirable than 'courageously'. Similarly also in the other cases.

Moreover, if one thing exceeds while the other falls short of the same standard of good, the one which exceeds is the more desirable; or if the one exceeds an even higher standard. Nay more, if there be two things both preferable to something, the one which is more highly preferable to it is more desirable than the less highly preferable. Moreover, when the excess of a thing is more desirable than the excess of something else, that thing is itself also more desirable than the other, as (e.g.) friendship than money: for an excess of friendship is more desirable than an excess of money. So also that of which a man would rather that it were his by his own doing is more desirable than what he would rather get by another's doing, e.g. friends than money. Moreover, judge by means of an addition, and see if the addition of A to the same thing as B makes the whole more desirable than does the addition of B. You must, however, beware of adducing a case in which the common term uses, or in some other way helps the case of, one of the things added to it, but not the other, as (e.g.) if you took a saw and a sickle in combination with the art of carpentry: for in the combination the saw is a more desirable thing, but it is not a more desirable thing without qualification. Again, a thing is more desirable if, when added to a lesser good, it makes the whole greater good. Likewise, also, you should judge by means of subtraction: for the thing upon whose subtraction the remainder is a lesser good may be taken to be a greater good, whichever it be whose subtraction makes the remainder a lesser good.

Also, if one thing be desirable for itself, and the other for the look of it, the former is more desirable, as (e.g.) health than beauty. A thing is defined as being desired for the look of it if, supposing no one knew of it, you would not care to have it. Also, it is more desirable both for itself and for the look of it, while the other thing is desirable on the one ground alone. Also, whichever is the more precious for itself, is also better and more desirable. A thing may be taken to be more precious in itself which we choose rather for itself, without anything else being likely to come of it.

Moreover, you should distinguish in how many senses 'desirable' is used, and with a view to what ends, e.g. expediency or honour or pleasure. For what is useful for all or most of them may be taken to be more desirable than what is not useful in like manner. If the same characters belong to both things you should look and see which possesses them more markedly, i.e. which of the two is the more pleasant or more honourable or more expedient. Again, that is more desirable which serves the better purpose, e.g. that which serves to promote virtue more than that which serves to promote pleasure. Likewise also in the case of objectionable things; for that is more objectionable which stands more in the way of what is desirable, e.g. disease more than ugliness: for disease is a greater hindrance both to pleasure and to being good.

Moreover, argue by showing that the thing in question is in like measure objectionable and desirable: for a thing of such a character that a man might well desire and object to it alike is less desirable than the other which is desirable only.

4

Comparisons of things together should therefore be conducted in the manner prescribed. The same commonplace rules are useful also for showing that anything is simply desirable or objectionable: for we have only to subtract the excess of one thing over another. For if what is more precious be more desirable, then also what is precious is desirable; and if what is more useful be more desirable, then also what is useful is desirable. Likewise, also, in the case of other things which admit of comparisons of that kind. For in some cases in the very course of comparing the things together we at once assert also that each of them, or the one of them, is desirable, e.g. whenever we call the one good 'by nature' and the other 'not by nature': for dearly what is good by nature is desirable.

5

The commonplace rules relating to comparative degrees and amounts ought to be taken in the most general possible form: for when so taken they are likely to be useful in a larger number of instances. It is possible to render some of the actual rules given above more universal by a slight alteration of the expression, e.g. that what by nature exhibits such and such a quality exhibits that quality in a greater degree than what exhibits it not by nature. Also, if one thing does, and another does not, impart such and such a quality to that which possesses it, or to which it belongs, then whichever does impart it is of that quality in greater degree than the one which does not impart it; and if both impart it, then that one exhibits it in a greater degree which imparts it in a greater degree.

Moreover, if in any character one thing exceeds and another falls short of the same standard; also, if the one exceeds something which exceeds a given standard, while the other does not reach that standard, then clearly the first-named thing exhibits that character in a greater degree. Moreover, you should judge by means of addition, and see if A when added to the same thing as B imparts to the whole such and such a character in a more marked degree than B, or if, when added to a thing which exhibits that character in a less degree, it imparts that character to the whole in a greater degree. Likewise, also, you may judge by means of subtraction: for a thing upon whose subtraction the remainder exhibits such and such a character in a less degree, itself exhibits that character in a greater degree. Also, things exhibit such and such a character in a greater degree if more free from admixture with their contraries; e.g. that is whiter which is more free from admixture with black. Moreover, apart from the rules given above, that has such and such a character in greater degree which admits in a greater degree of the definition proper to the given character; e.g. if the definition of 'white' be 'a colour which pierces the vision', then that is whiter which is in a greater degree a colour that pierces the vision.

6

If the question be put in a particular and not in a universal form, in the first place the universal constructive or destructive commonplace rules that have been given may all be brought into use. For in demolishing or establishing a thing universally we also show it in particular: for if it be true of all, it is true also of some, and if untrue of all, it is untrue of some. Especially handy and of general application are the commonplace rules

that are drawn from the opposites and co-ordinates and inflexions of a thing: for public opinion grants alike the claim that if all pleasure be good, then also all pain is evil, and the claim that if some pleasure be good, then also some pain is evil. Moreover, if some form of sensation be not a capacity, then also some form of failure of sensation is not a failure of capacity. Also, if the object of conception is in some cases an object of knowledge, then also some form of conceiving is knowledge. Again, if what is unjust be in some cases good, then also what is just is in some cases evil; and if what happens justly is in some cases evil, then also what happens unjustly is in some cases good. Also, if what is pleasant is in some cases objectionable, then pleasure is in some cases an objectionable thing. On the same principle, also, if what is pleasant is in some cases beneficial, then pleasure is in some cases a beneficial thing. The case is the same also as regards the things that destroy, and the processes of generation and destruction. For if anything that destroys pleasure or knowledge be in some cases good, then we may take it that pleasure or knowledge is in some cases an evil thing. Likewise, also, if the destruction of knowledge be in some cases a good thing or its production an evil thing, then knowledge will be in some cases an evil thing; e.g. if for a man to forget his disgraceful conduct be a good thing, and to remember it be an evil thing, then the knowledge of his disgraceful conduct may be taken to be an evil thing. The same holds also in other cases: in all such cases the premiss and the conclusion are equally likely to be accepted.

Moreover you should judge by means of greater or smaller or like degrees: for if some member of another genus exhibit such and such a character in a more marked degree than your object, while no member of that genus exhibits that character at all, then you may take it that neither does the object in question exhibit it; e.g. if some form of knowledge be good in a greater degree than pleasure, while no form of knowledge is good, then

you may take it that pleasure is not good either. Also, you should judge by a smaller or like degree in the same way: for so you will find it possible both to demolish and to establish a view, except that whereas both are possible by means of like degrees, by means of a smaller degree it is possible only to establish, not to overthrow. For if a certain form of capacity be good in a like degree to knowledge, and a certain form of capacity be good, then so also is knowledge; while if no form of capacity be good, then neither is knowledge. If, too, a certain form of capacity be good in a less degree than knowledge, and a certain form of capacity be good, then so also is knowledge; but if no form of capacity be good, there is no necessity that no form of knowledge either should be good. Clearly, then, it is only possible to establish a view by means of a less degree.

Not only by means of another genus can you overthrow a view, but also by means of the same, if you take the most marked instance of the character in question; e.g. if it be maintained that some form of knowledge is good, then, suppose it to be shown that prudence is not good, neither will any other kind be good, seeing that not even the kind upon which there is most general agreement is so. Moreover, you should go to work by means of an hypothesis; you should claim that the attribute, if it belongs or does not belong in one case, does so in a like degree in all, e.g. that if the soul of man be immortal, so are other souls as well, while if this one be not so, neither are the others. If, then, it be maintained that in some instance the attribute belongs, you must show that in some instance it does not belong: for then it will follow, by reason of the hypothesis, that it does not belong to any instance at all. If, on the other hand, it be maintained that it does not belong in some instance, you must show that it does belong in some instance, for in this way it will follow that it belongs to all instances. It is clear that the maker of the hypothesis universalizes the question, whereas it was stated in a particular form: for he claims that the maker of

a particular admission should make a universal admission, inasmuch as he claims that if the attribute belongs in one instance, it belongs also in all instances alike.

If the problem be indefinite, it is possible to overthrow a statement in only one way; e.g. if a man has asserted that pleasure is good or is not good, without any further definition. For if he meant that a particular pleasure is good, you must show universally that no pleasure is good, if the proposition in question is to be demolished. And likewise, also, if he meant that some particular pleasure is not good you must show universally that all pleasure is good: it is impossible to demolish it in any other way. For if we show that some particular pleasure is not good or is good, the proposition in question is not yet demolished. It is clear, then, that it is possible to demolish an indefinite statement in one way only, whereas it can be established in two ways: for whether we show universally that all pleasure is good, or whether we show that a particular pleasure is good, the proposition in question will have been proved. Likewise, also, supposing we are required to argue that some particular pleasure is not good, if we show that no pleasure is good or that a particular pleasure is not good, we shall have produced an argument in both ways, both universally and in particular, to show that some particular pleasure is not good. If, on the other hand, the statement made be definite, it will be possible to demolish it in two ways; e.g. if it be maintained that it is an attribute of some particular pleasure to be good, while of some it is not: for whether it be shown that all pleasure, or that no pleasure, is good, the proposition in question will have been demolished. If, however, he has stated that only one single pleasure is good, it is possible to demolish it in three ways: for by showing that all pleasure, or that no pleasure, or that more than one pleasure, is good, we shall have demolished the statement in question. If the statement be made still more definite, e.g. that prudence alone of the virtues

is knowledge, there are four ways of demolishing it: for if it be shown that all virtue is knowledge, or that no virtue is so, or that some other virtue (e.g. justice) is so, or that prudence itself is not knowledge, the proposition in question will have been demolished.

It is useful also to take a look at individual instances, in cases where some attribute has been said to belong or not to belong, as in the case of universal questions. Moreover, you should take a glance among genera, dividing them by their species until you come to those that are not further divisible, as has been said before:' for whether the attribute is found to belong in all cases or in none, you should, after adducing several instances, claim that he should either admit your point universally, or else bring an objection showing in what case it does not hold. Moreover, in cases where it is possible to make the accident definite either specifically or numerically, you should look and see whether perhaps none of them belongs, showing e.g. that time is not moved, nor yet a movement, by enumerating how many species there are of movement: for if none of these belong to time, clearly it does not move, nor yet is a movement. Likewise, also, you can show that the soul is not a number, by dividing all numbers into either odd or even: for then, if the soul be neither odd nor even, clearly it is not a number.

In regard then to Accident, you should set to work by means like these, and in this manner.

Book IV

1

Next we must go on to examine questions relating to Genus and Property. These are elements in the questions that relate to definitions, but dialecticians seldom address their inquiries to these by themselves. If, then, a genus be suggested for something that is, first take a look at all objects which belong to the same genus as the thing mentioned, and see whether the genus suggested is not predicated of one of them, as happens in the case of an accident: e.g. if 'good' be laid down to be the genus of 'pleasure', see whether some particular pleasure be not good: for, if so, clearly good' is not the genus of pleasure: for the genus is predicated of all the members of the same species. Secondly, see whether it be predicated not in the category of essence, but as an accident, as 'white' is predicated of 'snow', or 'self-moved' of the soul. For 'snow' is not a kind of 'white', and therefore 'white' is not the genus of snow, nor is the soul a kind of 'moving object': its motion is an accident of it, as it often is of an animal to walk or to be walking. Moreover, 'moving' does not seem to indicate the essence, but rather a state of doing or of having something done to it. Likewise, also, 'white': for it indicates not the essence of snow, but a certain quality of it. So that neither of them is predicated in the category of 'essence'.

Especially you should take a look at the definition of Accident, and see whether it fits the genus mentioned, as (e.g.) is also the case in the instances just given. For it is possible for a thing to be and not to be self-moved, and likewise, also, for it to be and not to be white. So that neither of these attributes is the genus but an accident, since we were saying that an accident is an attribute which can belong to a thing and also not belong.

Moreover, see whether the genus and the species be not found in the same division, but the one be a substance while the other

is a quality, or the one be a relative while the other is a quality, as (e.g.) 'slow' and 'swan' are each a substance, while 'white' is not a substance but a quality, so that 'white' is not the genus either of 'snow' or of 'swan'. Again, knowledge' is a relative, while 'good' and 'noble' are each a quality, so that good, or noble, is not the genus of knowledge. For the genera of relatives ought themselves also to be relatives, as is the case with 'double': for multiple', which is the genus of 'double', is itself also a relative. To speak generally, the genus ought to fall under the same division as the species: for if the species be a substance, so too should be the genus, and if the species be a quality, so too the genus should be a quality; e.g. if white be a quality, so too should colour be. Likewise, also, in other cases.

Again, see whether it be necessary or possible for the genus to partake of the object which has been placed in the genus. 'To partake' is defined as 'to admit the definition of that which is partaken. Clearly, therefore, the species partake of the genera, but not the genera of the species: for the species admits the definition of the genus, whereas the genus does not admit that of the species. You must look, therefore, and see whether the genus rendered partakes or can possibly partake of the species, e.g. if any one were to render anything as genus of 'being' or of 'unity': for then the result will be that the genus partakes of the species: for of everything that is, 'being' and 'unity' are predicated, and therefore their definition as well.

Moreover, see if there be anything of which the species rendered is true, while the genus is not so, e.g. supposing 'being' or 'object of knowledge' were stated to be the genus of 'object of opinion'. For 'object of opinion' will be a predicate of what does not exist; for many things which do not exist are objects of opinion; whereas that 'being' or 'object of knowledge' is not predicated of what does not exist is clear. So that neither 'being' nor 'object of knowledge' is the genus of 'object of opinion': for of the

objects of which the species is predicated, the genus ought to be predicated as well.

Again, see whether the object placed in the genus be quite unable to partake of any of its species: for it is impossible that it should partake of the genus if it do not partake of any of its species, except it be one of the species reached by the first division: these do partake of the genus alone. If, therefore, 'Motion' be stated as the genus of pleasure, you should look and see if pleasure be neither locomotion nor alteration, nor any of the rest of the given modes of motion: for clearly you may then take it that it does not partake of any of the species, and therefore not of the genus either, since what partakes of the genus must necessarily partake of one of the species as well: so that pleasure could not be a species of Motion, nor yet be one of the individual phenomena comprised under the term 'motion'. For individuals as well partake in the genus and the species, as (e.g.) an individual man partakes of both 'man' and 'animal'.

Moreover, see if the term placed in the genus has a wider denotation than the genus, as (e.g.) 'object of opinion' has, as compared with 'being': for both what is and what is not are objects of opinion, so that 'object of opinion' could not be a species of being: for the genus is always of wider denotation than the species. Again, see if the species and its genus have an equal denotation; suppose, for instance, that of the attributes which go with everything, one were to be stated as a species and the other as its genus, as for example Being and Unity: for everything has being and unity, so that neither is the genus of the other, since their denotation is equal. Likewise, also, if the 'first' of a series and the 'beginning' were to be placed one under the other: for the beginning is first and the first is the beginning, so that either both expressions are identical or at any rate neither is the genus of the other. The elementary principle in regard to all such cases is that the genus has a

wider denotation than the species and its differentia: for the differentia as well has a narrower denotation than the genus.

See also whether the genus mentioned fails, or might be generally thought to fail, to apply to some object which is not specifically different from the thing in question; or, if your argument be constructive, whether it does so apply. For all things that are not specifically different have the same genus. If, therefore, it be shown to apply to one, then clearly it applies to all, and if it fails to apply to one, clearly it fails to apply to any; e.g. if any one who assumes 'indivisible lines' were to say that the 'indivisible' is their genus. For the aforesaid term is not the genus of divisible lines, and these do not differ as regards their species from indivisible: for straight lines are never different from each other as regards their species.

2

Look and see, also, if there be any other genus of the given species which neither embraces the genus rendered nor yet falls under it, e.g. suppose any one were to lay down that 'knowledge' is the genus of justice. For virtue is its genus as well, and neither of these genera embraces the remaining one, so that knowledge could not be the genus of justice: for it is generally accepted that whenever one species falls under two genera, the one is embraced by the other. Yet a principle of this kind gives rise to a difficulty in some cases. For some people hold that prudence is both virtue and knowledge, and that neither of its genera is embraced by the other: although certainly not everybody admits that prudence is knowledge. If, however, any one were to admit the truth of this assertion, yet it would still be generally agreed to be necessary that the genera

of the same object must at any rate be subordinate either the one to the other or both to the same, as actually is the case with virtue and knowledge. For both fall under the same genus; for each of them is a state and a disposition. You should look, therefore, and see whether neither of these things is true of the genus rendered; for if the genera be subordinate neither the one to the other nor both to the same, then what is rendered could not be the true genus.

Look, also, at the genus of the genus rendered, and so continually at the next higher genus, and see whether all are predicated of the species, and predicated in the category of essence: for all the higher genera should be predicated of the species in the category of essence. If, then, there be anywhere a discrepancy, clearly what is rendered is not the true genus. [Again, see whether either the genus itself, or one of its higher genera, partakes of the species: for the higher genus does not partake of any of the lower.] If, then, you are overthrowing a view, follow the rule as given: if establishing one, then – suppose that what has been named as genus be admitted to belong to the species, only it be disputed whether it belongs as genus – it is enough to show that one of its higher genera is predicated of the species in the category of essence. For if one of them be predicated in the category of essence, all of them, both higher and lower than this one, if predicated at all of the species, will be predicated of it in the category of essence: so that what has been rendered as genus is also predicated in the category of essence. The premiss that when one genus is predicated in the category of essence, all the rest, if predicated at all, will be predicated in the category of essence, should be secured by induction. Supposing, however, that it be disputed whether what has been rendered as genus belongs at all, it is not enough to show that one of the higher genera is predicated of the species in the category of essence: e.g. if any one has rendered 'locomotion' as the genus of walking, it is not enough to show

that walking is ‘motion’ in order to show that it is ‘locomotion’, seeing that there are other forms of motion as well; but one must show in addition that walking does not partake of any of the species of motion produced by the same division except locomotion. For of necessity what partakes of the genus partakes also of one of the species produced by the first division of the genus. If, therefore, walking does not partake either of increase or decrease or of the other kinds of motion, clearly it would partake of locomotion, so that locomotion would be the genus of walking.

Again, look among the things of which the given species is predicated as genus, and see if what is rendered as its genus be also predicated in the category of essence of the very things of which the species is so predicated, and likewise if all the genera higher than this genus are so predicated as well. For if there be anywhere a discrepancy, clearly what has been rendered is not the true genus: for had it been the genus, then both the genera higher than it, and it itself, would all have been predicated in the category of essence of those objects of which the species too is predicated in the category of essence. If, then, you are overthrowing a view, it is useful to see whether the genus fails to be predicated in the category of essence of those things of which the species too is predicated. If establishing a view, it is useful to see whether it is predicated in the category of essence: for if so, the result will be that the genus and the species will be predicated of the same object in the category of essence, so that the same object falls under two genera: the genera must therefore of necessity be subordinate one to the other, and therefore if it be shown that the one we wish to establish as genus is not subordinate to the species, clearly the species would be subordinate to it, so that you may take it as shown that it is the genus.

Look, also, at the definitions of the genera, and see whether they apply both to the given species and to the objects which partake of the species. For of necessity the definitions of its genera must be predicated of the species and of the objects which partake of the species: if, then, there be anywhere a discrepancy, clearly what has been rendered is not the genus.

Again, see if he has rendered the differentia as the genus, e.g. 'immortal' as the genus of 'God'. For 'immortal' is a differentia of 'living being', seeing that of living beings some are mortal and others immortal. Clearly, then, a bad mistake has been made; for the differentia of a thing is never its genus. And that this is true is clear: for a thing's differentia never signifies its essence, but rather some quality, as do 'walking' and 'biped'.

Also, see whether he has placed the differentia inside the genus, e.g. by taking 'odd' as a number'. For 'odd' is a differentia of number, not a species. Nor is the differentia generally thought to partake of the genus: for what partakes of the genus is always either a species or an individual, whereas the differentia is neither a species nor an individual. Clearly, therefore, the differentia does not partake of the genus, so that 'odd' too is no species but a differentia, seeing that it does not partake of the genus.

Moreover, see whether he has placed the genus inside the species, e.g. by taking 'contact' to be a 'juncture', or 'mixture' a 'fusion', or, as in Plato's definition,' 'locomotion' to be the same as 'carriage'. For there is no necessity that contact should be juncture: rather, conversely, juncture must be contact: for what is in contact is not always joined, though what is joined is always in contact. Likewise, also, in the remaining instances: for mixture is not always a 'fusion' (for to mix dry things does not fuse them), nor is locomotion always 'carriage'. For walking is not generally thought to be carriage: for 'carriage' is mostly used

of things that change one place for another involuntarily, as happens in the case of inanimate things. Clearly, also, the species, in the instances given, has a wider denotation than the genus, whereas it ought to be vice versa. Again, see whether he has placed the differentia inside the species, by taking (e.g.) 'immortal' to be 'a god'. For the result will be that the species has an equal or wider denotation: and this cannot be, for always the differentia has an equal or a wider denotation than the species. Moreover, see whether he has placed the genus inside the differentia, by making 'colour' (e.g.) to be a thing that 'pierces', or 'number' a thing that is 'odd'. Also, see if he has mentioned the genus as differentia: for it is possible for a man to bring forward a statement of this kind as well, e.g. that 'mixture' is the differentia of 'fusion', or that change of place' is the differentia of 'carriage'. All such cases should be examined by means of the same principles: for they depend upon common rules: for the genus should have a wider denotation that its differentia, and also should not partake of its differentia; whereas, if it be rendered in this manner, neither of the aforesaid requirements can be satisfied: for the genus will both have a narrower denotation than its differentia, and will partake of it.

Again, if no differentia belonging to the genus be predicated of the given species, neither will the genus be predicated of it; e.g. of 'soul' neither 'odd' nor 'even' is predicated: neither therefore is 'number'. Moreover, see whether the species is naturally prior and abolishes the genus along with itself: for the contrary is the general view. Moreover, if it be possible for the genus stated, or for its differentia, to be absent from the alleged species, e.g. for 'movement' to be absent from the 'soul', or 'truth and falsehood' from 'opinion', then neither of the terms stated could be its genus or its differentia: for the general view is that the genus and the differentia accompany the species, as long as it exists.

3

Look and see, also, if what is placed in the genus partakes or could possibly partake of any contrary of the genus: for in that case the same thing will at the same time partake of contrary things, seeing that the genus is never absent from it, while it partakes, or can possibly partake, of the contrary genus as well. Moreover, see whether the species shares in any character which it is utterly impossible for any member of the genus to have. Thus (e.g.) if the soul has a share in life, while it is impossible for any number to live, then the soul could not be a species of number.

You should look and see, also, if the species be a homonym of the genus, and employ as your elementary principles those already stated for dealing with homonymity: for the genus and the species are synonymous.

Seeing that of every genus there is more than one species, look and see if it be impossible that there should be another species than the given one belonging to the genus stated: for if there should be none, then clearly what has been stated could not be a genus at all.

Look and see, also, if he has rendered as genus a metaphorical expression, describing (e.g. 'temperance' as a 'harmony': a 'harmony': for a genus is always predicated of its species in its literal sense, whereas 'harmony' is predicated of temperance not in a literal sense but metaphorically: for a harmony always consists in notes.

Moreover, if there be any contrary of the species, examine it. The examination may take different forms; first of all see if the

contrary as well be found in the same genus as the species, supposing the genus to have no contrary; for contraries ought to be found in the same genus, if there be no contrary to the genus. Supposing, on the other hand, that there is a contrary to the genus, see if the contrary of the species be found in the contrary genus: for of necessity the contrary species must be in the contrary genus, if there be any contrary to the genus. Each of these points is made plain by means of induction. Again, see whether the contrary of the species be not found in any genus at all, but be itself a genus, e.g. 'good': for if this be not found in any genus, neither will its contrary be found in any genus, but will itself be a genus, as happens in the case of 'good' and 'evil': for neither of these is found in a genus, but each of them is a genus. Moreover, see if both genus and species be contrary to something, and one pair of contraries have an intermediary, but not the other. For if the genera have an intermediary, so should their species as well, and if the species have, so should their genera as well, as is the case with (1) virtue and vice and (2) justice and injustice: for each pair has an intermediary. An objection to this is that there is no intermediary between health and disease, although there is one between evil and good. Or see whether, though there be indeed an intermediary between both pairs, i.e. both between the species and between the genera, yet it be not similarly related, but in one case be a mere negation of the extremes, whereas in the other case it is a subject. For the general view is that the relation should be similar in both cases, as it is in the cases of virtue and vice and of justice and injustice: for the intermediaries between both are mere negations. Moreover, whenever the genus has no contrary, look and see not merely whether the contrary of the species be found in the same genus, but the intermediate as well: for the genus containing the extremes contains the intermediates as well, as (e.g.) in the case of white and black: for 'colour' is the genus both of these and of all the intermediate colours as well.

An objection may be raised that ‘defect’ and ‘excess’ are found in the same genus (for both are in the genus ‘evil’), whereas moderate amount’, the intermediate between them, is found not in ‘evil’ but in ‘good’. Look and see also whether, while the genus has a contrary, the species has none; for if the genus be contrary to anything, so too is the species, as virtue to vice and justice to injustice.

Likewise. also, if one were to look at other instances, one would come to see clearly a fact like this. An objection may be raised in the case of health and disease: for health in general is the contrary of disease, whereas a particular disease, being a species of disease, e.g. fever and ophthalmia and any other particular disease, has no contrary.

If, therefore, you are demolishing a view, there are all these ways in which you should make your examination: for if the aforesaid characters do not belong to it, clearly what has been rendered is not the genus. If, on the other hand, you are establishing a view, there are three ways: in the first place, see whether the contrary of the species be found in the genus stated, suppose the genus have no contrary: for if the contrary be found in it, clearly the species in question is found in it as well. Moreover, see if the intermediate species is found in the genus stated: for whatever genus contains the intermediate contains the extremes as well. Again, if the genus have a contrary, look and see whether also the contrary species is found in the contrary genus: for if so, clearly also the species in question is found in the genus in question.

Again, consider in the case of the inflexions and the co-ordinates of species and genus, and see whether they follow likewise, both in demolishing and in establishing a view. For whatever attribute belongs or does not belong to one belongs or does not belong at the same time to all; e.g. if justice be a

particular form of knowledge, then also ‘justly’ is ‘knowingly’ and the just man is a man of knowledge: whereas if any of these things be not so, then neither is any of the rest of them.

4

Again, consider the case of things that bear a like relation to one another. Thus (e.g.) the relation of the pleasant to pleasure is like that of the useful to the good: for in each case the one produces the other. If therefore pleasure be a kind of ‘good’, then also the pleasant will be a kind of ‘useful’: for clearly it may be taken to be productive of good, seeing that pleasure is good. In the same way also consider the case of processes of generation and destruction; if (e.g.) to build be to be active, then to have built is to have been active, and if to learn be to recollect, then also to have learnt is to have recollected, and if to be decomposed be to be destroyed, then to have been decomposed is to have been destroyed, and decomposition is a kind of destruction. Consider also in the same way the case of things that generate or destroy, and of the capacities and uses of things; and in general, both in demolishing and in establishing an argument, you should examine things in the light of any resemblance of whatever description, as we were saying in the case of generation and destruction. For if what tends to destroy tends to decompose, then also to be destroyed is to be decomposed: and if what tends to generate tends to produce, then to be generated is to be produced, and generation is production. Likewise, also, in the case of the capacities and uses of things: for if a capacity be a disposition, then also to be capable of something is to be disposed to it, and if the use of anything be an activity, then to use it is to be active, and to have used it is to have been active.

If the opposite of the species be a privation, there are two ways of demolishing an argument, first of all by looking to see if the opposite be found in the genus rendered: for either the privation is to be found absolutely nowhere in the same genus, or at least not in the same ultimate genus: e.g. if the ultimate genus containing sight be sensation, then blindness will not be a sensation. Secondly, if there be a sensation. Secondly, if there be a privation opposed to both genus and species, but the opposite of the species be not found in the opposite of the genus, then neither could the species rendered be in the genus rendered. If, then, you are demolishing a view, you should follow the rule as stated; but if establishing one there is but one way: for if the opposite species be found in the opposite genus, then also the species in question would be found in the genus in question: e.g. if 'blindness' be a form of 'insensibility', then 'sight' is a form of 'sensation'.

Again, look at the negations of the genus and species and convert the order of terms, according to the method described in the case of Accident: e.g. if the pleasant be a kind of good, what is not good is not pleasant. For were this no something not good as well would then be pleasant. That, however, cannot be, for it is impossible, if 'good' be the genus of pleasant, that anything not good should be pleasant: for of things of which the genus is not predicated, none of the species is predicated either. Also, in establishing a view, you should adopt the same method of examination: for if what is not good be not pleasant, then what is pleasant is good, so that 'good' is the genus of 'pleasant'.

If the species be a relative term, see whether the genus be a relative term as well: for if the species be a relative term, so too is the genus, as is the case with 'double' and 'multiple': for each is a relative term. If, on the other hand, the genus be a relative term, there is no necessity that the species should be so as well:

for ‘knowledge’is a relative term, but not so ‘grammar’. Or possibly not even the first statement would be generally considered true: for virtue is a kind of ‘noble’ and a kind of ‘good’ thing, and yet, while ‘virtue’ is a relative term, ‘good’ and ‘noble’ are not relatives but qualities. Again, see whether the species fails to be used in the same relation when called by its own name, and when called by the name of its genus: e.g. if the term ‘double’ be used to mean the double of a ‘half’, then also the term ‘multiple’ ought to be used to mean multiple of a ‘half’. Otherwise ‘multiple’ could not be the genus of ‘double’.

Moreover, see whether the term fail to be used in the same relation both when called by the name of its genus, and also when called by those of all the genera of its genus. For if the double be a multiple of a half, then ‘in excess of ‘will also be used in relation to a ‘half’: and, in general, the double will be called by the names of all the higher genera in relation to a ‘half’. An objection may be raised that there is no necessity for a term to be used in the same relation when called by its own name and when called by that of its genus: for ‘knowledge’ is called knowledge ‘of an object’, whereas it is called a ‘state’ and ‘disposition’ not of an ‘object’ but of the ‘soul’.

Again, see whether the genus and the species be used in the same way in respect of the inflexions they take, e.g. datives and genitives and all the rest. For as the species is used, so should the genus be as well, as in the case of ‘double’ and its higher genera: for we say both ‘double of’ and ‘multiple of’ a thing. Likewise, also, in the case of ‘knowledge’: for both knowledge’ itself and its genera, e.g. ‘disposition’ and ‘state’, are said to be ‘of’ something. An objection may be raised that in some cases it is not so: for we say ‘superior to’ and ‘contrary to’ so and so, whereas ‘other’, which is the genus of these terms, demands not ‘to’ but ‘than’: for the expression is ‘other than’ so and so.

Again, see whether terms used in like case relationships fail to yield a like construction when converted, as do ‘double’ and ‘multiple’. For each of these terms takes a genitive both in itself and in its converted form: for we say both a half of’ and ‘a fraction of’ something. The case is the same also as regards both ‘knowledge’ and ‘conception’: for these take a genitive, and by conversion an ‘object of knowledge’ and an ‘object of conception’ are both alike used with a dative. If, then, in any cases the constructions after conversion be not alike, clearly the one term is not the genus of the other.

Again, see whether the species and the genus fail to be used in relation to an equal number of things: for the general view is that the uses of both are alike and equal in number, as is the case with ‘present’ and ‘grant’. For a present’ is of something or to some one, and also a ‘grant’ is of something and to some one: and ‘grant’ is the genus of ‘present’, for a ‘present’ is a ‘grant that need not be returned’. In some cases, however, the number of relations in which the terms are used happens not to be equal, for while ‘double’ is double of something, we speak of ‘in excess’ or ‘greater’ in something, as well as of or than something: for what is in excess or greater is always in excess in something, as well as in excess of something. Hence the terms in question are not the genera of ‘double’, inasmuch as they are not used in relation to an equal number of things with the species. Or possibly it is not universally true that species and genus are used in relation to an equal number of things.

See, also, if the opposite of the species have the opposite of the genus as its genus, e.g. whether, if ‘multiple’ be the genus of ‘double’, ‘fraction’ be also the genus of ‘half’. For the opposite of the genus should always be the genus of the opposite species. If, then, any one were to assert that knowledge is a kind of sensation, then also the object of knowledge will have to be a kind of object of sensation, whereas it is not: for an object of

knowledge is not always an object of sensation: for objects of knowledge include some of the objects of intuition as well. Hence 'object of sensation' is not the genus of 'object of knowledge': and if this be so, neither is 'sensation' the genus of 'knowledge'.

Seeing that of relative terms some are of necessity found in, or used of, the things in relation to which they happen at any time to be used (e.g. 'disposition' and 'state' and 'balance'; for in nothing else can the aforesaid terms possibly be found except in the things in relation to which they are used), while others need not be found in the things in relation to which they are used at any time, though they still may be (e.g. if the term 'object of knowledge' be applied to the soul: for it is quite possible that the knowledge of itself should be possessed by the soul itself, but it is not necessary, for it is possible for this same knowledge to be found in some one else), while for others, again, it is absolutely impossible that they should be found in the things in relation to which they happen at any time to be used (as e.g. that the contrary should be found in the contrary or knowledge in the object of knowledge, unless the object of knowledge happen to be a soul or a man) – you should look, therefore, and see whether he places a term of one kind inside a genus that is not of that kind, e.g. suppose he has said that 'memory' is the 'abiding of knowledge'. For 'abiding' is always found in that which abides, and is used of that, so that the abiding of knowledge also will be found in knowledge. Memory, then, is found in knowledge, seeing that it is the abiding of knowledge. But this is impossible, for memory is always found in the soul. The aforesaid commonplace rule is common to the subject of Accident as well: for it is all the same to say that 'abiding' is the genus of memory, or to allege that it is an accident of it. For if in any way whatever memory be the abiding of knowledge, the same argument in regard to it will apply.

5

Again, see if he has placed what is a ‘state’ inside the genus ‘activity’, or an activity inside the genus ‘state’, e.g. by defining ‘sensation’ as ‘movement communicated through the body’: for sensation is a ‘state’, whereas movement is an ‘activity’. Likewise, also, if he has said that memory is a ‘state that is retentive of a conception’, for memory is never a state, but rather an activity.

They also make a bad mistake who rank a ‘state’ within the ‘capacity’ that attends it, e.g. by defining ‘good temper’ as the ‘control of anger’, and ‘courage’ and ‘justice’ as ‘control of fears’ and of ‘gains’: for the terms ‘courageous’ and ‘good-tempered’ are applied to a man who is immune from passion, whereas ‘self-controlled’ describes the man who is exposed to passion and not led by it. Quite possibly, indeed, each of the former is attended by a capacity such that, if he were exposed to passion, he would control it and not be led by it: but, for all that, this is not what is meant by being ‘courageous’ in the one case, and ‘good tempered’ in the other; what is meant is an absolute immunity from any passions of that kind at all.

Sometimes, also, people state any kind of attendant feature as the genus, e.g. ‘pain’ as the genus of ‘anger’ and ‘conception’ as that of conviction’. For both of the things in question follow in a certain sense upon the given species, but neither of them is genus to it. For when the angry man feels pain, the pain bas appeared in him earlier than the anger: for his anger is not the cause of his pain, but his pain of his anger, so that anger emphatically is not pain. By the same reasoning, neither is conviction conception: for it is possible to have the same

conception even without being convinced of it, whereas this is impossible if conviction be a species of conception: for it is impossible for a thing still to remain the same if it be entirely transferred out of its species, just as neither could the same animal at one time be, and at another not be, a man. If, on the other hand, any one says that a man who has a conception must of necessity be also convinced of it, then 'conception' and 'conviction' will be used with an equal denotation, so that not even so could the former be the genus of the latter: for the denotation of the genus should be wider.

See, also, whether both naturally come to be anywhere in the same thing: for what contains the species contains the genus as well: e.g. what contains 'white' contains 'colour' as well, and what contains 'knowledge of grammar' contains 'knowledge' as well. If, therefore, any one says that 'shame' is 'fear', or that 'anger' is 'pain', the result will be that genus and species are not found in the same thing: for shame is found in the 'reasoning' faculty, whereas fear is in the 'spirited' faculty, and 'pain' is found in the faculty of 'desires'. (for in this pleasure also is found), whereas 'anger' is found in the 'spirited' faculty. Hence the terms rendered are not the genera, seeing that they do not naturally come to be in the same faculty as the species. Likewise, also, if 'friendship' be found in the faculty of desires, you may take it that it is not a form of 'wishing': for wishing is always found in the 'reasoning' faculty. This commonplace rule is useful also in dealing with Accident: for the accident and that of which it is an accident are both found in the same thing, so that if they do not appear in the same thing, clearly it is not an accident.

Again, see if the species partakes of the genus attributed only in some particular respect: for it is the general view that the genus is not thus imparted only in some particular respect: for a man is not an animal in a particular respect, nor is grammar

knowledge in a particular respect only. Likewise also in other instances. Look, therefore, and see if in the case of any of its species the genus be imparted only in a certain respect; e.g. if 'animal' has been described as an 'object of perception' or of 'sight'. For an animal is an object of perception or of sight in a particular respect only; for it is in respect of its body that it is perceived and seen, not in respect of its soul, so that – 'object of sight' and 'object of perception' could not be the genus of 'animal'.

Sometimes also people place the whole inside the part without detection, defining (e.g.) 'animal' as an 'animate body'; whereas the part is not predicated in any sense of the whole, so that 'body' could not be the genus of animal, seeing that it is a part.

See also if he has put anything that is blameworthy or objectionable into the class 'capacity' or 'capable', e.g. by defining a 'sophist' or a 'slanderer', or a 'thief' as 'one who is capable of secretly thieving other people's property'. For none of the aforesaid characters is so called because he is 'capable' in one of these respects: for even God and the good man are capable of doing bad things, but that is not their character: for it is always in respect of their choice that bad men are so called. Moreover, a capacity is always a desirable thing: for even the capacities for doing bad things are desirable, and therefore it is we say that even God and the good man possess them; for they are capable (we say) of doing evil. So then 'capacity' can never be the genus of anything blameworthy. Else, the result will be that what is blameworthy is sometimes desirable: for there will be a certain form of capacity that is blameworthy.

Also, see if he has put anything that is precious or desirable for its own sake into the class 'capacity' or 'capable' or 'productive' of anything. For capacity, and what is capable or productive of anything, is always desirable for the sake of something else.

Or see if he has put anything that exists in two genera or more into one of them only. For some things it is impossible to place in a single genus, e.g. the 'cheat' and the 'slanderer': for neither he who has the will without the capacity, nor he who has the capacity without the will, is a slanderer or cheat, but he who has both of them. Hence he must be put not into one genus, but into both the aforesaid genera.

Moreover, people sometimes in converse order render genus as differentia, and differentia as genus, defining (e.g.) astonishment as 'excess of wonderment' and conviction as 'vehemence of conception'. For neither 'excess' nor 'vehemence' is the genus, but the differentia: for astonishment is usually taken to be an 'excessive wonderment', and conviction to be a 'vehement conception', so that 'wonderment' and 'conception' are the genus, while 'excess' and 'vehemence' are the differentia. Moreover, if any one renders 'excess' and 'vehemence' as genera, then inanimate things will be convinced and astonished. For 'vehemence' and 'excess' of a thing are found in a thing which is thus vehement and in excess. If, therefore, astonishment be excess of wonderment the astonishment will be found in the wonderment, so that 'wonderment' will be astonished! Likewise, also, conviction will be found in the conception, if it be 'vehemence of conception', so that the conception will be convinced. Moreover, a man who renders an answer in this style will in consequence find himself calling vehemence vehement and excess excessive: for there is such a thing as a vehement conviction: if then conviction be 'vehemence', there would be a 'vehement vehemence'. Likewise, also, there is such a thing as excessive astonishment: if then astonishment be an excess, there would be an 'excessive excess'. Whereas neither of these things is generally believed, any more than that knowledge is a knower or motion a moving thing.

Sometimes, too, people make the bad mistake of putting an affection into that which is affected, as its genus, e.g. those who say that immortality is everlasting life: for immortality seems to be a certain affection or accidental feature of life. That this saying is true would appear clear if any one were to admit that a man can pass from being mortal and become immortal: for no one will assert that he takes another life, but that a certain accidental feature or affection enters into this one as it is. So then 'life' is not the genus of immortality.

Again, see if to an affection he has ascribed as genus the object of which it is an affection, by defining (e.g.) wind as 'air in motion'. Rather, wind is 'a movement of air': for the same air persists both when it is in motion and when it is still. Hence wind is not 'air' at all: for then there would also have been wind when the air was not in motion, seeing that the same air which formed the wind persists. Likewise, also, in other cases of the kind. Even, then, if we ought in this instance to admit the point that wind is 'air in motion', yet we should accept a definition of the kind, not about all those things of which the genus is not true, but only in cases where the genus rendered is a true predicate. For in some cases, e.g. 'mud' or 'snow', it is not generally held to be true. For people tell you that snow is 'frozen water' and mud is earth mixed with moisture', whereas snow is not water, nor mud earth, so that neither of the terms rendered could be the genus: for the genus should be true of all its species. Likewise neither is wine 'fermented water', as Empedocles speaks of 'water fermented in wood';' for it simply is not water at all.

6

Moreover, see whether the term rendered fail to be the genus of anything at all; for then clearly it also fails to be the genus of the species mentioned. Examine the point by seeing whether the objects that partake of the genus fail to be specifically different from one another, e.g. white objects: for these do not differ specifically from one another, whereas of a genus the species are always different, so that 'white' could not be the genus of anything.

Again, see whether he has named as genus or differentia some feature that goes with everything: for the number of attributes that follow everything is comparatively large: thus (e.g.) 'Being' and 'Unity' are among the number of attributes that follow everything. If, therefore, he has rendered 'Being' as a genus, clearly it would be the genus of everything, seeing that it is predicated of everything; for the genus is never predicated of anything except of its species. Hence Unity, inter alia, will be a species of Being. The result, therefore, is that of all things of which the genus is predicated, the species is predicated as well, seeing that Being and Unity are predicates of absolutely everything, whereas the predication of the species ought to be of narrower range. If, on the other hand, he has named as differentia some attribute that follows everything, clearly the denotation of the differentia will be equal to, or wider than, that of the genus. For if the genus, too, be some attribute that follows everything, the denotation of the differentia will be equal to its denotation, while if the genus do not follow everything, it will be still wider.

Moreover, see if the description 'inherent in S' be used of the genus rendered in relation to its species, as it is used of 'white' in the case of snow, thus showing clearly that it could not be the genus: for 'true of S' is the only description used of the genus in

relation to its species. Look and see also if the genus fails to be synonymous with its species. For the genus is always predicated of its species synonymously.

Moreover, beware, whenever both species and genus have a contrary, and he places the better of the contraries inside the worse genus: for the result will be that the remaining species will be found in the remaining genus, seeing that contraries are found in contrary genera, so that the better species will be found in the worse genus and the worse in the better: whereas the usual view is that of the better species the genus too is better. Also see if he has placed the species inside the worse and not inside the better genus, when it is at the same time related in like manner to both, as (e.g.) if he has defined the 'soul' as a 'form of motion' or 'a form of moving thing'. For the same soul is usually thought to be a principle alike of rest and of motion, so that, if rest is the better of the two, this is the genus into which the soul should have been put.

Moreover, judge by means of greater and less degrees: if overthrowing a view, see whether the genus admits of a greater degree, whereas neither the species itself does so, nor any term that is called after it: e.g. if virtue admits of a greater degree, so too does justice and the just man: for one man is called 'more just than another'. If, therefore, the genus rendered admits of a greater degree, whereas neither the species does so itself nor yet any term called after it, then what has been rendered could not be the genus.

Again, if what is more generally, or as generally, thought to be the genus be not so, clearly neither is the genus rendered. The commonplace rule in question is useful especially in cases where the species appears to have several predicates in the category of essence, and where no distinction has been drawn between them, and we cannot say which of them is genus; e.g.

both ‘pain’ and the ‘conception of a slight’ are usually thought to be predicates of ‘anger in the category of essence: for the angry man is both in pain and also conceives that he is slighted. The same mode of inquiry may be applied also to the case of the species, by comparing it with some other species: for if the one which is more generally, or as generally, thought to be found in the genus rendered be not found therein, then clearly neither could the species rendered be found therein.

In demolishing a view, therefore, you should follow the rule as stated. In establishing one, on the other hand, the commonplace rule that you should see if both the genus rendered and the species admit of a greater degree will not serve: for even though both admit it, it is still possible for one not to be the genus of the other. For both ‘beautiful’ and ‘white’ admit of a greater degree, and neither is the genus of the other. On the other hand, the comparison of the genera and of the species one with another is of use: e.g. supposing A and B to have a like claim to be genus, then if one be a genus, so also is the other. Likewise, also, if what has less claim be a genus, so also is what has more claim: e.g. if ‘capacity’ have more claim than ‘virtue’ to be the genus of self-control, and virtue be the genus, so also is capacity. The same observations will apply also in the case of the species. For instance, supposing A and B to have a like claim to be a species of the genus in question, then if the one be a species, so also is the other: and if that which is less generally thought to be so be a species, so also is that which is more generally thought to be so.

Moreover, to establish a view, you should look and see if the genus is predicated in the category of essence of those things of which it has been rendered as the genus, supposing the species rendered to be not one single species but several different ones: for then clearly it will be the genus. If, on the other, the species rendered be single, look and see whether the genus be

predicated in the category of essence of other species as well: for then, again, the result will be that it is predicated of several different species.

Since some people think that the differentia, too, is a predicate of the various species in the category of essence, you should distinguish the genus from the differentia by employing the aforesaid elementary principles – (a) that the genus has a wider denotation than the differentia; (b) that in rendering the essence of a thing it is more fitting to state the genus than the differentia: for any one who says that 'man' is an 'animal' shows what man is better than he who describes him as 'walking'; also (c) that the differentia always signifies a quality of the genus, whereas the genus does not do this of the differentia: for he who says 'walking' describes an animal of a certain quality, whereas he who says 'animal' describes an animal of a certain quality, whereas he who says 'animal' does not describe a walking thing of a certain quality.

The differentia, then, should be distinguished from the genus in this manner. Now seeing it is generally held that if what is musical, in being musical, possesses knowledge in some respect, then also 'music' is a particular kind of 'knowledge'; and also that if what walks is moved in walking, then 'walking' is a particular kind of 'movement'; you should therefore examine in the aforesaid manner any genus in which you want to establish the existence of something; e.g. if you wish to prove that 'knowledge' is a form of 'conviction', see whether the knower in knowing is convinced: for then clearly knowledge would be a particular kind of conviction. You should proceed in the same way also in regard to the other cases of this kind.

Moreover, seeing that it is difficult to distinguish whatever always follows along with a thing, and is not convertible with it, from its genus, if A follows B universally, whereas B does not

follow A universally – as e.g. ‘rest’ always follows a ‘calm’ and ‘divisibility’ follows ‘number’, but not conversely (for the divisible is not always a number, nor rest a calm) – you may yourself assume in your treatment of them that the one which always follows is the genus, whenever the other is not convertible with it: if, on the other hand, some one else puts forward the proposition, do not accept it universally. An objection to it is that ‘not-being’ always follows what is ‘coming to be’ (for what is coming to be is not) and is not convertible with it (for what is not is not always coming to be), and that still ‘not-being’ is not the genus of ‘coming to be’: for ‘not-being’ has not any species at all. Questions, then, in regard to Genus should be investigated in the ways described.

Book V

1

The question whether the attribute stated is or is not a property, should be examined by the following methods:

Any ‘property’ rendered is always either essential and permanent or relative and temporary: e.g. it is an ‘essential property’ of man to be ‘by nature a civilized animal’: a ‘relative property’ is one like that of the soul in relation to the body, viz. that the one is fitted to command, and the other to obey: a ‘permanent property’ is one like the property which belongs to God, of being an ‘immortal living being’: a ‘temporary property’

is one like the property which belongs to any particular man of walking in the gymnasium.

[The rendering of a property 'relatively' gives rise either to two problems or to four. For if he at the same time render this property of one thing and deny it of another, only two problems arise, as in the case of a statement that it is a property of a man, in relation to a horse, to be a biped. For one might try both to show that a man is not a biped, and also that a horse is a biped: in both ways the property would be upset. If on the other hand he render one apiece of two attributes to each of two things, and deny it in each case of the other, there will then be four problems; as in the case of a statement that it is a property of a man in relation to a horse for the former to be a biped and the latter a quadruped. For then it is possible to try to show both that a man is not naturally a biped, and that he is a quadruped, and also that the horse both is a biped, and is not a quadruped. If you show any of these at all, the intended attribute is demolished.]

An 'essential' property is one which is rendered of a thing in comparison with everything else and distinguishes the said thing from everything else, as does 'a mortal living being capable of receiving knowledge' in the case of man. A 'relative' property is one which separates its subject off not from everything else but only from a particular definite thing, as does the property which virtue possesses, in comparison with knowledge, viz. that the former is naturally produced in more than one faculty, whereas the latter is produced in that of reason alone, and in those who have a reasoning faculty. A 'permanent' property is one which is true at every time, and never fails, like being' compounded of soul and body', in the case of a living creature. A 'temporary' property is one which is true at some particular time, and does not of necessity always

follow; as, of some particular man, that he walks in the market-place.

To render a property 'relatively' to something else means to state the difference between them as it is found either universally and always, or generally and in most cases: thus a difference that is found universally and always, is one such as man possesses in comparison with a horse, viz. being a biped: for a man is always and in every case a biped, whereas a horse is never a biped at any time. On the other hand, a difference that is found generally and in most cases, is one such as the faculty of reason possesses in comparison with that of desire and spirit, in that the former commands, while the latter obeys: for the reasoning faculty does not always command, but sometimes also is under command, nor is that of desire and spirit always under command, but also on occasion assumes the command, whenever the soul of a man is vicious.

Of 'properties' the most 'arguable' are the essential and permanent and the relative. For a relative property gives rise, as we said before, to several questions: for of necessity the questions arising are either two or four, or that arguments in regard to these are several. An essential and a permanent property you can discuss in relation to many things, or can observe in relation to many periods of time: if essential', discuss it in comparison with many things: for the property ought to belong to its subject in comparison with every single thing that is, so that if the subject be not distinguished by it in comparison with everything else, the property could not have been rendered correctly. So a permanent property you should observe in relation to many periods of time; for if it does not or did not, or is not going to, belong, it will not be a property. On the other hand, about a temporary property we do not inquire further than in regard to the time called 'the present'; and so arguments in regard to it are not many; whereas an arguable'

question is one in regard to which it is possible for arguments both numerous and good to arise.

The so-called 'relative' property, then, should be examined by means of the commonplace arguments relating to Accident, to see whether it belongs to the one thing and not to the other: on the other hand, permanent and essential properties should be considered by the following methods.

2

First, see whether the property has or has not been rendered correctly. Of a rendering being incorrect or correct, one test is to see whether the terms in which the property is stated are not or are more intelligible – for destructive purposes, whether they are not so, and for constructive purposes, whether they are so. Of the terms not being more intelligible, one test is to see whether the property which he renders is altogether more unintelligible than the subject whose property he has stated: for, if so, the property will not have been stated correctly. For the object of getting a property constituted is to be intelligible: the terms therefore in which it is rendered should be more intelligible: for in that case it will be possible to conceive it more adequately, e.g. any one who has stated that it is a property of 'fire' to 'bear a very close resemblance to the soul', uses the term 'soul', which is less intelligible than 'fire' – for we know better what fire is than what soul is –, and therefore a 'very close resemblance to the soul' could not be correctly stated to be a property of fire. Another test is to see whether the attribution of A (property) to B (subject) fails to be more intelligible. For not only should the property be more intelligible than its subject, but also it should be something whose

attribution to the particular subject is a more intelligible attribution. For he who does not know whether it is an attribute of the particular subject at all, will not know either whether it belongs to it alone, so that whichever of these results happens, its character as a property becomes obscure. Thus (e.g.) a man who has stated that it is a property of fire to be 'the primary element wherein the soul is naturally found', has introduced a subject which is less intelligible than 'fire', viz. whether the soul is found in it, and whether it is found there primarily; and therefore to be 'the primary element in which the soul is naturally found' could not be correctly stated to be a property of 'fire'. On the other hand, for constructive purposes, see whether the terms in which the property is stated are more intelligible, and if they are more intelligible in each of the aforesaid ways. For then the property will have been correctly stated in this respect: for of constructive arguments, showing the correctness of a rendering, some will show the correctness merely in this respect, while others will show it without qualification. Thus (e.g.) a man who has said that the 'possession of sensation' is a property of 'animal' has both used more intelligible terms and has rendered the property more intelligible in each of the aforesaid senses; so that to 'possess sensation' would in this respect have been correctly rendered as a property of 'animal'.

Next, for destructive purposes, see whether any of the terms rendered in the property is used in more than one sense, or whether the whole expression too signifies more than one thing. For then the property will not have been correctly stated. Thus (e.g.) seeing that to 'being natural sentient' signifies more than one thing, viz. (1) to possess sensation, (2) to use one's sensation, being naturally sentient' could not be a correct statement of a property of 'animal'. The reason why the term you use, or the whole expression signifying the property, should not bear more than one meaning is this, that an expression bearing more than one meaning makes the object described

obscure, because the man who is about to attempt an argument is in doubt which of the various senses the expression bears: and this will not do, for the object of rendering the property is that he may understand. Moreover, in addition to this, it is inevitable that those who render a property after this fashion should be somehow refuted whenever any one addresses his syllogism to that one of the term's several meanings which does not agree. For constructive purposes, on the other hand, see whether both all the terms and also the expression as a whole avoid bearing more than one sense: for then the property will have been correctly stated in this respect. Thus (e.g.) seeing that 'body' does not bear several meanings, nor quickest to move upwards in space', nor yet the whole expression made by putting them together, it would be correct in this respect to say that it is a property of fire to be the 'body quickest to move upwards in space'.

Next, for destructive purposes, see if the term of which he renders the property is used in more than one sense, and no distinction has been drawn as to which of them it is whose property he is stating: for then the property will not have been correctly rendered. The reasons why this is so are quite clear from what has been said above: for the same results are bound to follow. Thus (e.g.) seeing that 'the knowledge of this' signifies many things for it means (1) the possession of knowledge by it, (2) the use of its knowledge by it, (3) the existence of knowledge about it, (4) the use of knowledge about it – no property of the 'knowledge of this' could be rendered correctly unless he draw a distinction as to which of these it is whose property he is rendering. For constructive purposes, a man should see if the term of which he is rendering the property avoids bearing many senses and is one and simple: for then the property will have been correctly stated in this respect. Thus (e.g.) seeing that 'man' is used in a single sense, 'naturally civilized animal' would be correctly stated as a property of man.

Next, for destructive purposes, see whether the same term has been repeated in the property. For people often do this undetected in rendering 'properties' also, just as they do in their 'definitions' as well: but a property to which this has happened will not have been correctly stated: for the repetition of it confuses the hearer; thus inevitably the meaning becomes obscure, and further, such people are thought to babble. Repetition of the same term is likely to happen in two ways; one is, when a man repeatedly uses the same word, as would happen if any one were to render, as a property of fire, 'the body which is the most rarefied of bodies' (for he has repeated the word 'body'); the second is, if a man replaces words by their definitions, as would happen if any one were to render, as a property of earth, 'the substance which is by its nature most easily of all bodies borne downwards in space', and were then to substitute 'substances of such and such a kind' for the word 'bodies': for 'body' and 'a substance of such and such a kind' mean one and the same thing. For he will have repeated the word 'substance', and accordingly neither of the properties would be correctly stated. For constructive purposes, on the other hand, see whether he avoids ever repeating the same term; for then the property will in this respect have been correctly rendered. Thus (e.g.) seeing that he who has stated 'animal capable of acquiring knowledge' as a property of man has avoided repeating the same term several times, the property would in this respect have been correctly rendered of man.

Next, for destructive purposes, see whether he has rendered in the property any such term as is a universal attribute. For one which does not distinguish its subject from other things is useless, and it is the business of the language Of 'properties', as also of the language of definitions, to distinguish. In the case contemplated, therefore, the property will not have been correctly rendered. Thus (e.g.) a man who has stated that it is a

property of knowledge to be a ‘conception incontrovertible by argument, because of its unity’, has used in the property a term of that kind, viz. ‘unity’, which is a universal attribute; and therefore the property of knowledge could not have been correctly stated. For constructive purposes, on the other hand, see whether he has avoided all terms that are common to everything and used a term that distinguishes the subject from something: for then the property will in this respect have been correctly stated. Thus (e.g.) inasmuch as he who has said that it is a property of a ‘living creature’ to ‘have a soul’ has used no term that is common to everything, it would in this respect have been correctly stated to be a property of a ‘living creature’ to ‘have a soul’.

Next, for destructive purposes see whether he renders more than one property of the same thing, without a definite proviso that he is stating more than one: for then the property will not have been correctly stated. For just as in the case of definitions too there should be no further addition beside the expression which shows the essence, so too in the case of properties nothing further should be rendered beside the expression that constitutes the property mentioned: for such an addition is made to no purpose. Thus (e.g.) a man who has said that it is a property of fire to be ‘the most rarefied and lightest body’ has rendered more than one property (for each term is a true predicate of fire alone); and so it could not be a correctly stated property of fire to be ‘the most rarefied and lightest body’. On the other hand, for constructive purposes, see whether he has avoided rendering more than one property of the same thing, and has rendered one only: for then the property will in this respect have been correctly stated. Thus (e.g.) a man who has said that it is a property of a liquid to be a ‘body adaptable to every shape’ has rendered as its property a single character and not several, and so the property of ‘liquid’ would in this respect have been correctly stated.

3

Next, for destructive purposes, see whether he has employed either the actual subject whose property he is rendering, or any of its species: for then the property will not have been correctly stated. For the object of rendering the property is that people may understand: now the subject itself is just as unintelligible as it was to start with, while any one of its species is posterior to it, and so is no more intelligible. Accordingly it is impossible to understand anything further by the use of these terms. Thus (e.g.) any one who has said that it is property of 'animal' to be 'the substance to which «man» belongs as a species' has employed one of its species, and therefore the property could not have been correctly stated. For constructive purposes, on the other hand, see whether he avoids introducing either the subject itself or any of its species: for then the property will in this respect have been correctly stated. Thus (e.g.) a man who has stated that it is a property of a living creature to be 'compounded of soul and body' has avoided introducing among the rest either the subject itself or any of its species, and therefore in this respect the property of a 'living creature' would have been correctly rendered.

You should inquire in the same way also in the case of other terms that do or do not make the subject more intelligible: thus, for destructive purposes, see whether he has employed anything either opposite to the subject or, in general, anything simultaneous by nature with it or posterior to it: for then the property will not have been correctly stated. For an opposite is simultaneous by nature with its opposite, and what is simultaneous by nature or is posterior to it does not make its subject more intelligible. Thus (e.g.) any one who has said that it

is a property of good to be ‘the most direct opposite of evil’, has employed the opposite of good, and so the property of good could not have been correctly rendered. For constructive purposes, on the other hand, see whether he has avoided employing anything either opposite to, or, in general, simultaneous by nature with the subject, or posterior to it: for then the property will in this respect have been correctly rendered. Thus (e.g.) a man who has stated that it is a property of knowledge to be ‘the most convincing conception’ has avoided employing anything either opposite to, or simultaneous by nature with, or posterior to, the subject; and so the property of knowledge would in this respect have been correctly stated.

Next, for destructive purposes, see whether he has rendered as property something that does not always follow the subject but sometimes ceases to be its property: for then the property will not have been correctly described. For there is no necessity either that the name of the subject must also be true of anything to which we find such an attribute belonging; nor yet that the name of the subject will be untrue of anything to which such an attribute is found not to belong. Moreover, in addition to this, even after he has rendered the property it will not be clear whether it belongs, seeing that it is the kind of attribute that may fall: and so the property will not be clear. Thus (e.g.) a man who has stated that it is a property of animal ‘sometimes to move and sometimes to stand still’ rendered the kind of property which sometimes is not a property, and so the property could not have been correctly stated. For constructive purposes, on the other hand, see whether he has rendered something that of necessity must always be a property: for then the property will have been in this respect correctly stated. Thus (e.g.) a man who has stated that it is a property of virtue to be ‘what makes its possessor good’ has rendered as property something that always follows, and so the property of virtue would in this respect have been correctly rendered.

Next, for destructive purposes, see whether in rendering the property of the present time he has omitted to make a definite proviso that it is the property of the present time which he is rendering: for else the property will not have been correctly stated. For in the first place, any unusual procedure always needs a definite proviso: and it is the usual procedure for everybody to render as property some attribute that always follows. In the second place, a man who omits to provide definitely whether it was the property of the present time which he intended to state, is obscure: and one should not give any occasion for adverse criticism. Thus (e.g.) a man who has stated it as the property of a particular man 'to be sitting with a particular man', states the property of the present time, and so he cannot have rendered the property correctly, seeing that he has described it without any definite proviso. For constructive purposes, on the other hand, see whether, in rendering the property of the present time, he has, in stating it, made a definite proviso that it is the property of the present time that he is stating: for then the property will in this respect have been correctly stated. Thus (e.g.) a man who has said that it is the property of a particular man 'to be walking now', has made this distinction in his statement, and so the property would have been correctly stated.

Next, for destructive purposes, see whether he has rendered a property of the kind whose appropriateness is not obvious except by sensation: for then the property will not have been correctly stated. For every sensible attribute, once it is taken beyond the sphere of sensation, becomes uncertain. For it is not clear whether it still belongs, because it is evidenced only by sensation. This principle will be true in the case of any attributes that do not always and necessarily follow. Thus (e.g.) any one who has stated that it is a property of the sun to be 'the brightest star that moves over the earth', has used in describing the property an expression of that kind, viz. 'to move over the

earth', which is evidenced by sensation; and so the sun's property could not have been correctly rendered: for it will be uncertain, whenever the sun sets, whether it continues to move over the earth, because sensation then fails us. For constructive purposes, on the other hand, see whether he has rendered the property of a kind that is not obvious to sensation, or, if it be sensible, must clearly belong of necessity: for then the property will in this respect have been correctly stated. Thus (e.g.) a man who has stated that it is a property of a surface to be 'the primary thing that is coloured', has introduced amongst the rest a sensible quality, 'to be coloured', but still a quality such as manifestly always belongs, and so the property of 'surface' would in this respect have been correctly rendered.

Next, for destructive purposes, see whether he has rendered the definition as a property: for then the property will not have been correctly stated: for the property of a thing ought not to show its essence. Thus (e.g.) a man who has said that it is the property of man to be 'a walking, biped animal' has rendered a property of man so as to signify his essence, and so the property of man could not have been correctly rendered. For constructive purposes, on the other hand, see whether the property which he has rendered forms a predicate convertible with its subject, without, however, signifying its essence: for then the property will in this respect have been correctly rendered. Thus (e.g.) he who has stated that it is a property of man to be a 'naturally civilized animal' has rendered the property so as to be convertible with its subject, without, however, showing its essence, and so the property of man' would in this respect have been correctly rendered.

Next, for destructive purposes, see whether he has rendered the property without having placed the subject within its essence. For of properties, as also of definitions, the first term to be rendered should be the genus, and then the rest of it should be

appended immediately afterwards, and should distinguish its subject from other things. Hence a property which is not stated in this way could not have been correctly rendered. Thus (e.g.) a man who has said that it is a property of a living creature to 'have a soul' has not placed 'living creature' within its essence, and so the property of a living creature could not have been correctly stated. For constructive purposes, on the other hand, see whether a man first places within its essence the subject whose property he is rendering, and then appends the rest: for then the property will in this respect have been correctly rendered. Thus (e.g.) he who has stated that is a property of man to be an 'animal capable of receiving knowledge', has rendered the property after placing the subject within its essence, and so the property of 'man' would in this respect have been correctly rendered.

4

The inquiry, then, whether the property has been correctly rendered or no, should be made by these means. The question, on the other hand, whether what is stated is or is not a property at all, you should examine from the following points of view. For the commonplace arguments which establish absolutely that the property is accurately stated will be the same as those that constitute it a property at all: accordingly they will be described in the course of them.

Firstly, then, for destructive purposes, take a look at each subject of which he has rendered the property, and see (e.g.) if it fails to belong to any of them at all, or to be true of them in that particular respect, or to be a property of each of them in respect of that character of which he has rendered the property: for

then what is stated to be a property will not be a property. Thus, for example, inasmuch as it is not true of the geometrician that he 'cannot be deceived by an argument' (for a geometrician is deceived when his figure is misdrawn), it could not be a property of the man of science that he is not deceived by an argument. For constructive purposes, on the other hand, see whether the property rendered be true of every instance, and true in that particular respect: for then what is stated not to be a property will be a property. Thus, for example, in as much as the description 'an animal capable of receiving knowledge' is true of every man, and true of him qua man, it would be a property of man to be 'an animal capable of receiving knowledge'. commonplace rule means – for destructive purposes, see if the description fails to be true of that of which the name is true; and if the name fails to be true of that of which the description is true: for constructive purposes, on the other hand, see if the description too is predicated of that of which the name is predicated, and if the name too is predicated of that of which the description is predicated.]

Next, for destructive purposes, see if the description fails to apply to that to which the name applies, and if the name fails to apply to that to which the description applies: for then what is stated to be a property will not be a property. Thus (e.g.) inasmuch as the description 'a living being that partakes of knowledge' is true of God, while 'man' is not predicated of God, to be a living being that partakes of knowledge' could not be a property of man. For constructive purposes, on the other hand, see if the name as well be predicated of that of which the description is predicated, and if the description as well be predicated of that of which the name is predicated. For then what is stated not to be a property will be a property. Thus (e.g.) the predicate 'living creature' is true of that of which 'having a soul' is true, and 'having a soul' is true of that of which the

predicate ‘living creature’ is true; and so ‘having a soul would be a property of ‘living creature’.

Next, for destructive purposes, see if he has rendered a subject as a property of that which is described as ‘in the subject’: for then what has been stated to be a property will not be a property. Thus (e.g.) inasmuch as he who has rendered ‘fire’ as the property of ‘the body with the most rarefied particles’, has rendered the subject as the property of its predicate, ‘fire’ could not be a property of ‘the body with the most rarefied particles’. The reason why the subject will not be a property of that which is found in the subject is this, that then the same thing will be the property of a number of things that are specifically different. For the same thing has quite a number of specifically different predicates that belong to it alone, and the subject will be a property of all of these, if any one states the property in this way. For constructive purposes, on the other hand, see if he has rendered what is found in the subject as a property of the subject: for then what has been stated not to be a property will be a property, if it be predicated only of the things of which it has been stated to be the property. Thus (e.g.) he who has said that it is a property of ‘earth’ to be ‘specifically the heaviest body’ has rendered of the subject as its property something that is said of the thing in question alone, and is said of it in the manner in which a property is predicated, and so the property of earth would have been rightly stated.

Next, for destructive purposes, see if he has rendered the property as partaken of: for then what is stated to be a property will not be a property. For an attribute of which the subject partakes is a constituent part of its essence: and an attribute of that kind would be a differentia applying to some one species. E.g. inasmuch as he who has said that ‘walking on two feet’ is property of man has rendered the property as partaken of, ‘walking on two feet’ could not be a property of ‘man’. For

constructive purposes, on the other hand, see if he has avoided rendering the property as partaken of, or as showing the essence, though the subject is predicated convertibly with it: for then what is stated not to be a property will be a property. Thus (e.g.) he who has stated that to be 'naturally sentient' is a property of 'animal' has rendered the property neither as partaken of nor as showing the essence, though the subject is predicated convertibly with it; and so to be 'naturally sentient' would be a property of 'animal'.

Next, for destructive purposes, see if the property cannot possibly belong simultaneously, but must belong either as posterior or as prior to the attribute described in the name: for then what is stated to be a property will not be a property either never, or not always. Thus (e.g.) inasmuch as it is possible for the attribute 'walking through the market-place' to belong to an object as prior and as posterior to the attribute 'man', 'walking through the market-place' could not be a property of 'man' either never, or not always. For constructive purposes, on the other hand, see if it always and of necessity belongs simultaneously, without being either a definition or a differentia: for then what is stated not to be a property will be a property. Thus (e.g.) the attribute 'an animal capable of receiving knowledge' always and of necessity belongs simultaneously with the attribute 'man', and is neither differentia nor definition of its subject, and so 'an animal capable of receiving knowledge' would be a property of 'man'.

Next, for destructive purposes, see if the same thing fails to be a property of things that are the same as the subject, so far as they are the same: for then what is stated to be a property will not be a property. Thus, for example, inasmuch as it is no property of a 'proper object of pursuit' to 'appear good to certain persons', it could not be a property of the 'desirable' either to 'appear good to certain persons': for 'proper object of pursuit'

and ‘desirable’ mean the same. For constructive purposes, on the other hand, see if the same thing be a property of something that is the same as the subject, in so far as it is the same. For then is stated not to be a property will be a property. Thus (e.g.) inasmuch as it is called a property of a man, in so far as he is a man, ‘to have a tripartite soul’, it would also be a property of a mortal, in so far as he is a mortal, to have a tripartite soul. This commonplace rule is useful also in dealing with Accident: for the same attributes ought either to belong or not belong to the same things, in so far as they are the same.

Next, for destructive purposes, see if the property of things that are the same in kind as the subject fails to be always the same in kind as the alleged property: for then neither will what is stated to be the property of the subject in question. Thus (e.g.) inasmuch as a man and a horse are the same in kind, and it is not always a property of a horse to stand by its own initiative, it could not be a property of a man to move by his own initiative; for to stand and to move by his own initiative are the same in kind, because they belong to each of them in so far as each is an ‘animal’. For constructive purposes, on the other hand, see if of things that are the same in kind as the subject the property that is the same as the alleged property is always true: for then what is stated not to be a property will be a property. Thus (e.g.) since it is a property of man to be a ‘walking biped,’ it would also be a property of a bird to be a ‘flying biped’: for each of these is the same in kind, in so far as the one pair have the sameness of species that fall under the same genus, being under the genus ‘animal’, while the other pair have that of differentiae of the genus, viz. of ‘animal’. This commonplace rule is deceptive whenever one of the properties mentioned belongs to some one species only while the other belongs to many, as does ‘walking quadruped’.

Inasmuch as ‘same’ and ‘different’ are terms used in several senses, it is a job to render to a sophistical questioner a property that belongs to one thing and that only. For an attribute that belongs to something qualified by an accident will also belong to the accident taken along with the subject which it qualifies; e.g. an attribute that belongs to ‘man’ will belong also to ‘white man’, if there be a white man, and one that belongs to ‘white man’ will belong also to ‘man’. One might, then, bring captious criticism against the majority of properties, by representing the subject as being one thing in itself, and another thing when combined with its accident, saying, for example, that ‘man’ is one thing, and white man’ another, and moreover by representing as different a certain state and what is called after that state. For an attribute that belongs to the state will belong also to what is called after that state, and one that belongs to what is called after a state will belong also to the state: e.g. inasmuch as the condition of the scientist is called after his science, it could not be a property of ‘science’ that it is ‘incontrovertible by argument’; for then the scientist also will be incontrovertible by argument. For constructive purposes, however, you should say that the subject of an accident is not absolutely different from the accident taken along with its subject; though it is called ‘another’ thing because the mode of being of the two is different: for it is not the same thing for a man to be a man and for a white man to be a white man. Moreover, you should take a look along at the inflections, and say that the description of the man of science is wrong: one should say not ‘it’ but ‘he is incontrovertible by argument’; while the description of Science is wrong too: one should say not ‘it’ but ‘she is incontrovertible by argument’. For against an objector who sticks at nothing the defence should stick at nothing.

5

Next, for destructive purposes, see if, while intending to render an attribute that naturally belongs, he states it in his language in such a way as to indicate one that invariably belongs: for then it would be generally agreed that what has been stated to be a property is upset. Thus (e.g.) the man who has said that 'biped' is a property of man intends to render the attribute that naturally belongs, but his expression actually indicates one that invariably belongs: accordingly, 'biped' could not be a property of man: for not every man is possessed of two feet. For constructive purposes, on the other hand, see if he intends to render the property that naturally belongs, and indicates it in that way in his language: for then the property will not be upset in this respect. Thus (e.g.) he who renders as a property of 'man' the phrase 'an animal capable of receiving knowledge' both intends, and by his language indicates, the property that belongs by nature, and so 'an animal capable of receiving knowledge' would not be upset or shown in that respect not to be a property of man.

Moreover, as regards all the things that are called as they are primarily after something else, or primarily in themselves, it is a job to render the property of such things. For if you render a property as belonging to the subject that is so called after something else, then it will be true of its primary subject as well; whereas if you state it of its primary subject, then it will be predicated also of the thing that is so called after this other. Thus (e.g.) if any one renders , coloured' as the property of 'surface', 'coloured' will be true of body as well; whereas if he render it of 'body', it will be predicated also of 'surface'. Hence the name as well will not be true of that of which the description is true.

In the case of some properties it mostly happens that some error is incurred because of a failure to define how as well as to what things the property is stated to belong. For every one tries to render as the property of a thing something that belongs to it either naturally, as 'biped' belongs to 'man', or actually, as 'having four fingers' belongs to a particular man, or specifically, as 'consisting of most rarefied particles' belongs to 'fire', or absolutely, as 'life' to 'living being', or one that belongs to a thing only as called after something else, as 'wisdom' to the 'soul', or on the other hand primarily, as 'wisdom' to the 'rational faculty', or because the thing is in a certain state, as 'incontrovertible by argument' belongs to a 'scientist' (for simply and solely by reason of his being in a certain state will he be 'incontrovertible by argument'), or because it is the state possessed by something, as 'incontrovertible by argument' belongs to 'science', or because it is partaken of, as 'sensation' belongs to 'animal' (for other things as well have sensation, e.g. man, but they have it because they already partake of 'animal'), or because it partakes of something else, as 'life' belongs to a particular kind of 'living being'. Accordingly he makes a mistake if he has failed to add the word 'naturally', because what belongs naturally may fail to belong to the thing to which it naturally belongs, as (e.g.) it belongs to a man to have two feet: so too he errs if he does not make a definite proviso that he is rendering what actually belongs, because one day that attribute will not be what it now is, e.g. the man's possession of four fingers. So he errs if he has not shown that he states a thing to be such and such primarily, or that he calls it so after something else, because then its name too will not be true of that of which the description is true, as is the case with 'coloured', whether rendered as a property of 'surface' or of 'body'. So he errs if he has not said beforehand that he has rendered a property to a thing either because that thing possesses a state, or because it is a state possessed by something; because then it will not be a

property. For, supposing he renders the property to something as being a state possessed, it will belong to what possesses that state; while supposing he renders it to what possesses the state, it will belong to the state possessed, as did 'incontrovertible by argument' when stated as a property of 'science' or of the 'scientist'. So he errs if he has not indicated beforehand that the property belongs because the thing partakes of, or is partaken of by, something; because then the property will belong to certain other things as well. For if he renders it because its subject is partaken of, it will belong to the things which partake of it; whereas if he renders it because its subject partakes of something else, it will belong to the things partaken of, as (e.g.) if he were to state 'life' to be a property of a 'particular kind of living being', or just of 'living being. So he errs if he has not expressly distinguished the property that belongs specifically, because then it will belong only to one of the things that fall under the term of which he states the property: for the superlative belongs only to one of them, e.g. 'lightest' as applied to 'fire'. Sometimes, too, a man may even add the word 'specifically', and still make a mistake. For the things in question should all be of one species, whenever the word 'specifically' is added: and in some cases this does not occur, as it does not, in fact, in the case of fire. For fire is not all of one species; for live coals and flame and light are each of them 'fire', but are of different species. The reason why, whenever 'specifically' is added, there should not be any species other than the one mentioned, is this, that if there be, then the property in question will belong to some of them in a greater and to others in a less degree, as happens with 'consisting of most rarefied particles' in the case of fire: for 'light' consists of more rarefied particles than live coals and flame. And this should not happen unless the name too be predicated in a greater degree of that of which the description is truer; otherwise the rule that where the description is truer the name

too should be truer is not fulfilled. Moreover, in addition to this, the same attribute will be the property both of the term which has it absolutely and of that element therein which has it in the highest degree, as is the condition of the property 'consisting of most rarefied particles' in the case of 'fire': for this same attribute will be the property of 'light' as well: for it is 'light' that 'consists of the most rarefied particles'. If, then, any one else renders a property in this way one should attack it; for oneself, one should not give occasion for this objection, but should define in what manner one states the property at the actual time of making the statement.

Next, for destructive purposes, see if he has stated a thing as a property of itself: for then what has been stated to be a property will not be a property. For a thing itself always shows its own essence, and what shows the essence is not a property but a definition. Thus (e.g.) he who has said that 'becoming' is a property of 'beautiful' has rendered the term as a property of itself (for 'beautiful' and 'becoming' are the same); and so 'becoming' could not be a property of 'beautiful'. For constructive purposes, on the other hand, see if he has avoided rendering a thing as a property of itself, but has yet stated a convertible predicate: for then what is stated not to be a property will be a property. Thus he who has stated 'animate substance' as a property of 'living-creature' has not stated 'living-creature' as a property of itself, but has rendered a convertible predicate, so that 'animate substance' would be a property of 'living-creature'.

Next, in the case of things consisting of like parts, you should look and see, for destructive purposes, if the property of the whole be not true of the part, or if that of the part be not predicated of the whole: for then what has been stated to be the property will not be a property. In some cases it happens that this is so: for sometimes in rendering a property in the case of

things that consist of like parts a man may have his eye on the whole, while sometimes he may address himself to what is predicated of the part: and then in neither case will it have been rightly rendered. Take an instance referring to the whole: the man who has said that it is a property of the 'sea' to be 'the largest volume of salt water', has stated the property of something that consists of like parts, but has rendered an attribute of such a kind as is not true of the part (for a particular sea is not 'the largest volume of salt water'); and so the largest volume of salt water' could not be a property of the 'sea'. Now take one referring to the part: the man who has stated that it is a property of 'air' to be 'breathable' has stated the property of something that consists of like parts, but he has stated an attribute such as, though true of some air, is still not predicable of the whole (for the whole of the air is not breathable); and so 'breathable' could not be a property of 'air'. For constructive purposes, on the other hand, see whether, while it is true of each of the things with similar parts, it is on the other hand a property of them taken as a collective whole: for then what has been stated not to be a property will be a property. Thus (e.g.) while it is true of earth everywhere that it naturally falls downwards, it is a property of the various particular pieces of earth taken as 'the Earth', so that it would be a property of 'earth' 'naturally to fall downwards'.

6

Next, look from the point of view of the respective opposites, and first (a) from that of the contraries, and see, for destructive purposes, if the contrary of the term rendered fails to be a property of the contrary subject. For then neither will the contrary of the first be a property of the contrary of the second.

Thus (e.g.) inasmuch as injustice is contrary to justice, and the lowest evil to the highest good, but 'to be the highest good' is not a property of 'justice', therefore 'to be the lowest evil' could not be a property of 'injustice'. For constructive purposes, on the other hand, see if the contrary is the property of the contrary: for then also the contrary of the first will be the property of the contrary of the second. Thus (e.g.) inasmuch as evil is contrary to good, and objectionable to desirable, and 'desirable' is a property of 'good', 'objectionable' would be a property of 'evil'.

Secondly (h) look from the point of view of relative opposites and see, for destructive purposes, if the correlative of the term rendered fails to be a property of the correlative of the subject: for then neither will the correlative of the first be a property of the correlative of the second. Thus (e.g.) inasmuch as 'double' is relative to 'half', and 'in excess' to 'exceeded', while 'in excess' is not a property of 'double', exceeded' could not be a property of 'half'. For constructive purposes, on the other hand, see if the correlative of the alleged property is a property of the subject's correlative: for then also the correlative of the first will be a property of the correlative of the second: e.g. inasmuch as 'double' is relative to 'half', and the proportion 1:2 is relative to the proportion 2:1, while it is a property of 'double' to be 'in the proportion of 2 to 1', it would be a property of 'half' to be 'in the proportion of 1 to 2'.

Thirdly (c) for destructive purposes, see if an attribute described in terms of a state (X) fails to be a property of the given state (Y): for then neither will the attribute described in terms of the privation (of X) be a property of the privation (of Y). Also if, on the other hand, an attribute described in terms of the privation (of X) be not a property of the given privation (of Y), neither will the attribute described in terms of the state (X) be a property of the state (Y). Thus, for example, inasmuch as it is not predicated as a property of 'deafness' to be a 'lack of sensation', neither

could it be a property of 'hearing' to be a 'sensation'. For constructive purposes, on the other hand, see if an attribute described in terms of a state (X) is a property of the given state (Y): for then also the attribute that is described in terms of the privation (of X) will be a property of the privation (of Y). Also, if an attribute described in terms of a privation (of X) be a property of the privation (of Y), then also the attribute that is described in terms of the state (X) will be a property of the state (Y). Thus (e.g.) inasmuch as 'to see' is a property of 'sight', inasmuch as we have sight, 'failure to see' would be a property of 'blindness', inasmuch as we have not got the sight we should naturally have.

Next, look from the point of view of positive and negative terms; and first (a) from the point of view of the predicates taken by themselves. This common-place rule is useful only for a destructive purpose. Thus (e.g.) see if the positive term or the attribute described in terms of it is a property of the subject: for then the negative term or the attribute described in terms of it will not be a property of the subject. Also if, on the other hand, the negative term or the attribute described in terms of it is a property of the subject, then the positive term or the attribute described in terms of it will not be a property of the subject: e.g. inasmuch as 'animate' is a property of 'living creature', 'inanimate' could not be a property of 'living creature'.

Secondly (b) look from the point of view of the predicates, positive or negative, and their respective subjects; and see, for destructive purposes, if the positive term falls to be a property of the positive subject: for then neither will the negative term be a property of the negative subject. Also, if the negative term fails to be a property of the negative subject, neither will the positive term be a property of the positive subject. Thus (e.g.) inasmuch as 'animal' is not a property of 'man', neither could 'not-animal' be a property of 'not-man'. Also if 'not-animal'

seems not to be a property of 'not-man', neither will 'animal' be a property of 'man'. For constructive purposes, on the other hand, see if the positive term is a property of the positive subject: for then the negative term will be a property of the negative subject as well. Also if the negative term be a property of the negative subject, the positive will be a property of the positive as well. Thus (e.g.) inasmuch as it is a property of 'not-living being' 'not to live', it would be a property of 'living being' 'to live': also if it seems to be a property of 'living being' 'to live', it will also seem to be a property of 'not-living being' 'not to live'.

Thirdly (c) look from the point of view of the subjects taken by themselves, and see, for destructive purposes, if the property rendered is a property of the positive subject: for then the same term will not be a property of the negative subject as well. Also, if the term rendered be a property of the negative subject, it will not be a property of the positive. Thus (e.g.) inasmuch as 'animate' is a property of 'living creature', 'animate' could not be a property of 'not-living creature'. For constructive purposes, on the other hand, if the term rendered fails to be a property of the affirmative subject it would be a property of the negative. This commonplace rule is, however, deceptive: for a positive term is not a property of a negative, or a negative of a positive. For a positive term does not belong at all to a negative, while a negative term, though it belongs to a positive, does not belong as a property.

Next, look from the point of view of the coordinate members of a division, and see, for destructive purposes, if none of the co-ordinate members (parallel with the property rendered) be a property of any of the remaining set of co-ordinate members (parallel with the subject): for then neither will the term stated be a property of that of which it is stated to be a property. Thus (e.g.) inasmuch as 'sensible living being' is not a property of any

of the other living beings, 'intelligible living being' could not be a property of God. For constructive purposes, on the other hand, see if some one or other of the remaining co-ordinate members (parallel with the property rendered) be a property of each of these co-ordinate members (parallel with the subject): for then the remaining one too will be a property of that of which it has been stated not to be a property. Thus (e.g.) inasmuch as it is a property of 'wisdom' to be essentially 'the natural virtue of the rational faculty', then, taking each of the other virtues as well in this way, it would be a property of 'temperance' to be essentially 'the natural virtue of the faculty of desire'.

Next, look from the point of view of the inflexions, and see, for destructive purposes, if the inflexion of the property rendered fails to be a property of the inflexion of the subject: for then neither will the other inflexion be a property of the other inflexion. Thus (e.g.) inasmuch as 'beautifully' is not a property of 'justly', neither could 'beautiful' be a property of 'just'. For constructive purposes, on the other hand, see if the inflexion of the property rendered is a property of the inflexion of the subject: for then also the other inflexion will be a property of the other inflexion. Thus (e.g.) inasmuch as 'walking biped' is a property of man, it would also be any one's property 'as a man' to be described 'as a walking biped'. Not only in the case of the actual term mentioned should one look at the inflexions, but also in the case of its opposites, just as has been laid down in the case of the former commonplace rules as well.' Thus, for destructive purposes, see if the inflexion of the opposite of the property rendered fails to be the property of the inflexion of the opposite of the subject: for then neither will the inflexion of the other opposite be a property of the inflexion of the other opposite. Thus (e.g.) inasmuch as 'well' is not a property of 'justly', neither could 'badly' be a property of 'unjustly'. For constructive purposes, on the other hand, see if the inflexion of the opposite of the property originally suggested is a property of

the inflexion of the opposite of the original subject: for then also the inflexion of the other opposite will be a property of the inflexion of the other opposite. Thus (e.g.) inasmuch as 'best' is a property of 'the good', 'worst' also will be a property of 'the evil'.

7

Next, look from the point of view of things that are in a like relation, and see, for destructive purposes, if what is in a relation like that of the property rendered fails to be a property of what is in a relation like that of the subject: for then neither will what is in a relation like that of the first be a property of what is in a relation like that of the second. Thus (e.g.) inasmuch as the relation of the builder towards the production of a house is like that of the doctor towards the production of health, and it is not a property of a doctor to produce health, it could not be a property of a builder to produce a house. For constructive purposes, on the other hand, see if what is in a relation like that of the property rendered is a property of what is in a relation like that of the subject: for then also what is in a relation like that of the first will be a property of what is in a relation like that of the second. Thus (e.g.) inasmuch as the relation of a doctor towards the possession of ability to produce health is like that of a trainer towards the possession of ability to produce vigour, and it is a property of a trainer to possess the ability to produce vigour, it would be a property of a doctor to possess the ability to produce health.

Next look from the point of view of things that are identically related, and see, for destructive purposes, if the predicate that is identically related towards two subjects fails to be a property of

the subject which is identically related to it as the subject in question; for then neither will the predicate that is identically related to both subjects be a property of the subject which is identically related to it as the first. If, on the other hand, the predicate which is identically related to two subjects is the property of the subject which is identically related to it as the subject in question, then it will not be a property of that of which it has been stated to be a property. (e.g.) inasmuch as prudence is identically related to both the noble and the base, since it is knowledge of each of them, and it is not a property of prudence to be knowledge of the noble, it could not be a property of prudence to be knowledge of the base. If, on the other hand, it is a property of prudence to be the knowledge of the noble, it could not be a property of it to be the knowledge of the base.] For it is impossible for the same thing to be a property of more than one subject. For constructive purposes, on the other hand, this commonplace rule is of no use: for what is 'identically related' is a single predicate in process of comparison with more than one subject.

Next, for destructive purposes, see if the predicate qualified by the verb 'to be' fails to be a property of the subject qualified by the verb 'to be': for then neither will the destruction of the one be a property of the other qualified by the verb 'to be destroyed', nor will the 'becoming'the one be a property of the other qualified by the verb 'to become'. Thus (e.g.) inasmuch as it is not a property of 'man' to be an animal, neither could it be a property of becoming a man to become an animal; nor could the destruction of an animal be a property of the destruction of a man. In the same way one should derive arguments also from 'becoming' to 'being' and 'being destroyed', and from 'being destroyed' to 'being' and to 'becoming' exactly as they have just been given from 'being' to 'becoming' and 'being destroyed'. For constructive purposes, on the other hand, see if the subject set down as qualified by the verb 'to be' has the predicate set down

as so qualified, as its property: for then also the subject qualified by the very 'to become' will have the predicate qualified by 'to become' as its property, and the subject qualified by the verb to be destroyed' will have as its property the predicate rendered with this qualification. Thus, for example, inasmuch as it is a property of man to be a mortal, it would be a property of becoming a man to become a mortal, and the destruction of a mortal would be a property of the destruction of a man. In the same way one should derive arguments also from 'becoming' and 'being destroyed' both to 'being' and to the conclusions that follow from them, exactly as was directed also for the purpose of destruction.

Next take a look at the 'idea' of the subject stated, and see, for destructive purposes, if the suggested property fails to belong to the 'idea' in question, or fails to belong to it in virtue of that character which causes it to bear the description of which the property was rendered: for then what has been stated to be a property will not be a property. Thus (e.g.) inasmuch as 'being motionless' does not belong to 'man-himself' qua 'man', but qua 'idea', it could not be a property of 'man' to be motionless. For constructive purposes, on the other hand, see if the property in question belongs to the idea, and belongs to it in that respect in virtue of which there is predicated of it that character of which the predicate in question has been stated not to be a property: for then what has been stated not to be a property will be a property. Thus (e.g.) inasmuch as it belongs to 'living-creature-itself' to be compounded of soul and body, and further this belongs to it qua 'living-creature', it would be a property of 'living-creature' to be compounded of soul and body.

8

Next look from the point of view of greater and less degrees, and first (a) for destructive purposes, see if what is more-P fails to be a property of what is more-S: for then neither will what is less-P be a property of what is less-S, nor least-P of least-S, nor most-P of most-S, nor P simply of S simply. Thus (e.g.) inasmuch as being more highly coloured is not a property of what is more a body, neither could being less highly coloured be a property of what is less a body, nor being coloured be a property of body at all. For constructive purposes, on the other hand, see if what is more-P is a property of what is more-S: for then also what is less-P will be a property of what is less S, and least-P of least-S, and most-P of most-S, and P simply of S simply. Thus (e.g.) inasmuch as a higher degree of sensation is a property of a higher degree of life, a lower degree of sensation also would be a property of a lower degree of life, and the highest of the highest and the lowest of the lowest degree, and sensation simply of life simply.

Also you should look at the argument from a simple predication to the same qualified types of predication, and see, for destructive purposes, if P simply fails to be a property of S simply; for then neither will more-P be a property of more-S, nor less-P of less-S, nor most-P of most-S, nor least-P of least-S. Thus (e.g.) inasmuch as 'virtuous' is not a property of 'man', neither could 'more virtuous' be a property of what is 'more human'. For constructive purposes, on the other hand, see if P simply is a property of S simply: for then more P also will be a property of more-S, and less-P of less-S, and least-P of least-S, and most-P of most-S. Thus (e.g.) a tendency to move upwards by nature is a property of fire, and so also a greater tendency to move upwards by nature would be a property of what is more fiery. In the same way too one should look at all these matters from the point of view of the others as well.

Secondly (b) for destructive purposes, see if the more likely property fails to be a property of the more likely subject: for then neither will the less likely property be a property of the less likely subject. Thus (e.g.) inasmuch as 'perceiving' is more likely to be a property of 'animal' than 'knowing' of 'man', and 'perceiving' is not a property of 'animal', 'knowing' could not be a property of 'man'. For constructive purposes, on the other hand, see if the less likely property is a property of the less likely subject; for then too the more likely property will be a property of the more likely subject. Thus (e.g.) inasmuch as 'to be naturally civilized' is less likely to be a property of man than 'to live' of an animal, and it is a property of man to be naturally civilized, it would be a property of animal to live.

Thirdly (c) for destructive purposes, see if the predicate fails to be a property of that of which it is more likely to be a property: for then neither will it be a property of that of which it is less likely to be a property: while if it is a property of the former, it will not be a property of the latter. Thus (e.g.) inasmuch as 'to be coloured' is more likely to be a property of a 'surface' than of a 'body', and it is not a property of a surface, 'to be coloured' could not be a property of 'body'; while if it is a property of a 'surface', it could not be a property of a 'body'. For constructive purposes, on the other hand, this commonplace rule is not of any use: for it is impossible for the same thing to be a property of more than one thing.

Fourthly (d) for destructive purposes, see if what is more likely to be a property of a given subject fails to be its property: for then neither will what is less likely to be a property of it be its property. Thus (e.g.) inasmuch as 'sensible' is more likely than 'divisible' to be a property of 'animal', and 'sensible' is not a property of animal, 'divisible' could not be a property of animal. For constructive purposes, on the other hand, see if what is less likely to be a property of it is a property; for then what is more

likely to be a property of it will be a property as well. Thus, for example, inasmuch as 'sensation' is less likely to be a property of 'animal' than life', and 'sensation' is a property of animal, 'life' would be a property of animal.

Next, look from the point of view of the attributes that belong in a like manner, and first (a) for destructive purposes, see if what is as much a property fails to be a property of that of which it is as much a property: for then neither will that which is as much a property as it be a property of that of which it is as much a property. Thus (e.g.) inasmuch as 'desiring' is as much a property of the faculty of desire as reasoning' is a property of the faculty of reason, and desiring is not a property of the faculty of desire, reasoning could not be a property of the faculty of reason. For constructive purposes, on the other hand, see if what is as much a property is a property of that of which it is as much a property: for then also what is as much a property as it will be a property of that of which it is as much a property. Thus (e.g.) inasmuch as it is as much a property of 'the faculty of reason' to be 'the primary seat of wisdom' as it is of 'the faculty of desire' to be 'the primary seat of temperance', and it is a property of the faculty of reason to be the primary seat of wisdom, it would be a property of the faculty of desire to be the primary seat of temperance.

Secondly (b) for destructive purposes, see if what is as much a property of anything fails to be a property of it: for then neither will what is as much a property be a property of it. Thus (e.g.) inasmuch as 'seeing' is as much a property of man as 'hearing', and 'seeing' is not a property of man, 'hearing' could not be a property of man. For constructive purposes, on the other hand, see if what is as much a property of it is its property: for then what is as much a property of it as the former will be its property as well. Thus (e.g.) it is as much a property of the soul to be the primary possessor of a part that desires as of a part

that reasons, and it is a property of the soul to be the primary possessor of a part that desires, and so it be a property of the soul to be the primary possessor of a part that reasons.

Thirdly (c) for destructive purposes, see if it fails to be a property of that of which it is as much a property: for then neither will it be a property of that of which it is as much a property as of the former, while if it be a property of the former, it will not be a property of the other. Thus (e.g.) inasmuch as 'to burn' is as much a property of 'flame' as of 'live coals', and 'to burn' is not a property of flame, 'to burn' could not be a property of live coals: while if it is a property of flame, it could not be a property of live coals. For constructive purposes, on the other hand, this commonplace rule is of no use.

The rule based on things that are in a like relation' differs from the rule based on attributes that belong in a like manner,' because the former point is secured by analogy, not from reflection on the belonging of any attribute, while the latter is judged by a comparison based on the fact that an attribute belongs.

Next, for destructive purposes, see if in rendering the property potentially, he has also through that potentiality rendered the property relatively to something that does not exist, when the potentiality in question cannot belong to what does not exist: for then what is stated to be a property will not be a property. Thus (e.g.) he who has said that 'breathable' is a property of 'air' has, on the one hand, rendered the property potentially (for that is 'breathable' which is such as can be breathed), and on the other hand has also rendered the property relatively to what does not exist: – for while air may exist, even though there exist no animal so constituted as to breathe the air, it is not possible to breathe it if no animal exist: so that it will not, either, be a property of air to be such as can be breathed at a time when

there exists no animal such as to breathe it and so it follows that 'breathable' could not be a property of air.

For constructive purposes, see if in rendering the property potentially he renders the property either relatively to something that exists, or to something that does not exist, when the potentiality in question can belong to what does not exist: for then what has been stated not to be a property will be a property. Thus e.g.) he who renders it as a property of 'being' to be 'capable of being acted upon or of acting', in rendering the property potentially, has rendered the property relatively to something that exists: for when 'being' exists, it will also be capable of being acted upon or of acting in a certain way: so that to be 'capable of being acted upon or of acting' would be a property of 'being'.

Next, for destructive purposes, see if he has stated the property in the superlative: for then what has been stated to be a property will not be a property. For people who render the property in that way find that of the object of which the description is true, the name is not true as well: for though the object perish the description will continue in being none the less; for it belongs most nearly to something that is in being. An example would be supposing any one were to render 'the lightest body' as a property of 'fire': for, though fire perish, there eh re will still be some form of body that is the lightest, so that 'the lightest body' could not be a property of fire. For constructive purposes, on the other hand, see if he has avoided rendering the property in the superlative: for then the property will in this respect have been property of man has not rendered the property correctly stated. Thus (e.g.) inasmuch as he in the superlative, the property would in who states 'a naturally civilized animal' as a this respect have been correctly stated.

Book VI

1

The discussion of Definitions falls into five parts. For you have to show either (1) that it is not true at all to apply the expression as well to that to which the term is applied (for the definition of Man ought to be true of every man); or (2) that though the object has a genus, he has failed to put the object defined into the genus, or to put it into the appropriate genus (for the framer of a definition should first place the object in its genus, and then append its differences: for of all the elements of the definition the genus is usually supposed to be the principal mark of the essence of what is defined): or (3) that the expression is not peculiar to the object (for, as we said above as well, a definition ought to be peculiar): or else (4) see if, though he has observed all the aforesaid cautions, he has yet failed to define the object, that is, to express its essence. (5) It remains, apart from the foregoing, to see if he has defined it, but defined it incorrectly.

Whether, then, the expression be not also true of that of which the term is true you should proceed to examine according to the commonplace rules that relate to Accident. For there too the question is always 'Is so and so true or untrue?': for whenever we argue that an accident belongs, we declare it to be true, while whenever we argue that it does not belong, we declare it to be untrue. If, again, he has failed to place the object in the appropriate genus, or if the expression be not peculiar to the

object, we must go on to examine the case according to the commonplace rules that relate to genus and property.

It remains, then, to prescribe how to investigate whether the object has been either not defined at all, or else defined incorrectly. First, then, we must proceed to examine if it has been defined incorrectly: for with anything it is easier to do it than to do it correctly. Clearly, then, more mistakes are made in the latter task on account of its greater difficulty. Accordingly the attack becomes easier in the latter case than in the former.

Incorrectness falls into two branches: (1) first, the use of obscure language (for the language of a definition ought to be the very clearest possible, seeing that the whole purpose of rendering it is to make something known); (secondly, if the expression used be longer than is necessary: for all additional matter in a definition is superfluous. Again, each of the aforesaid branches is divided into a number of others.

2

One commonplace rule, then, in regard to obscurity is, See if the meaning intended by the definition involves an ambiguity with any other, e.g. 'Becoming is a passage into being', or 'Health is the balance of hot and cold elements'. Here 'passage' and 'balance' are ambiguous terms: it is accordingly not clear which of the several possible senses of the term he intends to convey. Likewise also, if the term defined be used in different senses and he has spoken without distinguishing between them: for then it is not clear to which of them the definition rendered applies, and one can then bring a captious objection on the ground that the definition does not apply to all the things whose definition he has rendered: and this kind of thing is

particularly easy in the case where the definer does not see the ambiguity of his terms. Or, again, the questioner may himself distinguish the various senses of the term rendered in the definition, and then institute his argument against each: for if the expression used be not adequate to the subject in any of its senses, it is clear that he cannot have defined it in any sense aright.

Another rule is, See if he has used a metaphorical expression, as, for instance, if he has defined knowledge as 'unsupplantable', or the earth as a 'nurse', or temperance as a 'harmony'. For a metaphorical expression is always obscure. It is possible, also, to argue sophistically against the user of a metaphorical expression as though he had used it in its literal sense: for the definition stated will not apply to the term defined, e.g. in the case of temperance: for harmony is always found between notes. Moreover, if harmony be the genus of temperance, then the same object will occur in two genera of which neither contains the other: for harmony does not contain virtue, nor virtue harmony. Again, see if he uses terms that are unfamiliar, as when Plato describes the eye as 'brow-shaded', or a certain spider as poison-fanged', or the marrow as 'boneformed'. For an unusual phrase is always obscure.

Sometimes a phrase is used neither ambiguously, nor yet metaphorically, nor yet literally, as when the law is said to be the 'measure' or 'image' of the things that are by nature just. Such phrases are worse than metaphor; for the latter does make its meaning to some extent clear because of the likeness involved; for those who use metaphors do so always in view of some likeness: whereas this kind of phrase makes nothing clear; for there is no likeness to justify the description 'measure' or 'image', as applied to the law, nor is the law ordinarily so called in a literal sense. So then, if a man says that the law is literally a 'measure' or an 'image', he speaks falsely: for an

image is something produced by imitation, and this is not found in the case of the law. If, on the other hand, he does not mean the term literally, it is clear that he has used an unclear expression, and one that is worse than any sort of metaphorical expression.

Moreover, see if from the expression used the definition of the contrary be not clear; for definitions that have been correctly rendered also indicate their contraries as well. Or, again, see if, when it is merely stated by itself, it is not evident what it defines: just as in the works of the old painters, unless there were an inscription, the figures used to be unrecognizable.

3

If, then, the definition be not clear, you should proceed to examine on lines such as these. If, on the other hand, he has phrased the definition redundantly, first of all look and see whether he has used any attribute that belongs universally, either to real objects in general, or to all that fall under the same genus as the object defined: for the mention of this is sure to be redundant. For the genus ought to divide the object from things in general, and the differentia from any of the things contained in the same genus. Now any term that belongs to everything separates off the given object from absolutely nothing, while any that belongs to all the things that fall under the same genus does not separate it off from the things contained in the same genus. Any addition, then, of that kind will be pointless.

Or see if, though the additional matter may be peculiar to the given term, yet even when it is struck out the rest of the expression too is peculiar and makes clear the essence of the

term. Thus, in the definition of man, the addition 'capable of receiving knowledge' is superfluous; for strike it out, and still the expression is peculiar and makes clear his essence. Speaking generally, everything is superfluous upon whose removal the remainder still makes the term that is being defined clear. Such, for instance, would also be the definition of the soul, assuming it to be stated as a 'self-moving number'; for the soul is just 'the self-moving', as Plato defined it. Or perhaps the expression used, though appropriate, yet does not declare the essence, if the word 'number' be eliminated. Which of the two is the real state of the case it is difficult to determine clearly: the right way to treat the matter in all cases is to be guided by convenience. Thus (e.g.) it is said that the definition of phlegm is the 'undigested moisture that comes first off food'. Here the addition of the word 'undigested' is superfluous, seeing that 'the first' is one and not many, so that even when undigested' is left out the definition will still be peculiar to the subject: for it is impossible that both phlegm and also something else should both be the first to arise from the food. Or perhaps the phlegm is not absolutely the first thing to come off the food, but only the first of the undigested matters, so that the addition 'undigested' is required; for stated the other way the definition would not be true unless the phlegm comes first of all.

Moreover, see if anything contained in the definition fails to apply to everything that falls under the same species: for this sort of definition is worse than those which include an attribute belonging to all things universally. For in that case, if the remainder of the expression be peculiar, the whole too will be peculiar: for absolutely always, if to something peculiar anything whatever that is true be added, the whole too becomes peculiar. Whereas if any part of the expression do not apply to everything that falls under the same species, it is impossible that the expression as a whole should be peculiar: for it will not

be predicated convertibly with the object; e.g. 'a walking biped animal six feet high': for an expression of that kind is not predicated convertibly with the term, because the attribute 'six feet high' does not belong to everything that falls under the same species.

Again, see if he has said the same thing more than once, saying (e.g.) 'desire' is a 'conation for the pleasant'. For 'desire' is always 'for the pleasant', so that what is the same as desire will also be 'for the pleasant'. Accordingly our definition of desire becomes 'conation-for-the-pleasant': for the word 'desire' is the exact equivalent of the words 'conation-for-the-pleasant', so that both alike will be 'for the pleasant'. Or perhaps there is no absurdity in this; for consider this instance: 'Man is a biped': therefore, what is the same as man is a biped: but 'a walking biped animal' is the same as man, and therefore walking biped animal is a biped'. But this involves no real absurdity. For 'biped' is not a predicate of 'walking animal': if it were, then we should certainly have 'biped' predicated twice of the same thing; but as a matter of fact the subject said to be a biped is'a walking biped animal', so that the word 'biped' is only used as a predicate once. Likewise also in the case of 'desire' as well: for it is not 'conation' that is said to be 'for the pleasant', but rather the whole idea, so that there too the predication is only made once. Absurdity results, not when the same word is uttered twice, but when the same thing is more than once predicated of a subject; e.g. if he says, like Xenocrates, that wisdom defines and contemplates reality:' for definition is a certain type of contemplation, so that by adding the words 'and contemplates' over again he says the same thing twice over. Likewise, too, those fail who say that 'cooling' is 'the privation of natural heat'. For all privation is a privation of some natural attribute, so that the addition of the word 'natural' is superfluous: it would have been enough to say 'privation of heat', for the word 'privation' shows of itself that the heat meant is natural heat.

Again, see if a universal have been mentioned and then a particular case of it be added as well, e.g. 'Equity is a remission of what is expedient and just'; for what is just is a branch of what is expedient and is therefore included in the latter term: its mention is therefore redundant, an addition of the particular after the universal has been already stated. So also, if he defines 'medicine' as 'knowledge of what makes for health in animals and men', or 'the law' as 'the image of what is by nature noble and just'; for what is just is a branch of what is noble, so that he says the same thing more than once.

4

Whether, then, a man defines a thing correctly or incorrectly you should proceed to examine on these and similar lines. But whether he has mentioned and defined its essence or no, should be examined as follows: First of all, see if he has failed to make the definition through terms that are prior and more intelligible. For the reason why the definition is rendered is to make known the term stated, and we make things known by taking not any random terms, but such as are prior and more intelligible, as is done in demonstrations (for so it is with all teaching and learning); accordingly, it is clear that a man who does not define through terms of this kind has not defined at all. Otherwise, there will be more than one definition of the same thing: for clearly he who defines through terms that are prior and more intelligible has also framed a definition, and a better one, so that both would then be definitions of the same object. This sort of view, however, does not generally find acceptance: for of each real object the essence is single: if, then, there are to be a number of definitions of the same thing, the essence of the object will be the same as it is represented to be

in each of the definitions, and these representations are not the same, inasmuch as the definitions are different. Clearly, then, any one who has not defined a thing through terms that are prior and more intelligible has not defined it at all.

The statement that a definition has not been made through more intelligible terms may be understood in two senses, either supposing that its terms are absolutely less intelligible, or supposing that they are less intelligible to us: for either sense is possible. Thus absolutely the prior is more intelligible than the posterior, a point, for instance, than a line, a line than a plane, and a plane than a solid; just as also a unit is more intelligible than a number; for it is the prius and starting-point of all number. Likewise, also, a letter is more intelligible than a syllable. Whereas to us it sometimes happens that the converse is the case: for the solid falls under perception most of all – more than a plane – and a plane more than a line, and a line more than a point; for most people learn things like the former earlier than the latter; for any ordinary intelligence can grasp them, whereas the others require an exact and exceptional understanding.

Absolutely, then, it is better to try to make what is posterior known through what is prior, inasmuch as such a way of procedure is more scientific. Of course, in dealing with persons who cannot recognize things through terms of that kind, it may perhaps be necessary to frame the expression through terms that are intelligible to them. Among definitions of this kind are those of a point, a line, and a plane, all of which explain the prior by the posterior; for they say that a point is the limit of a line, a line of a plane, a plane of a solid. One must, however, not fail to observe that those who define in this way cannot show the essential nature of the term they define, unless it so happens that the same thing is more intelligible both to us and also absolutely, since a correct definition must define a thing

through its genus and its differentiae, and these belong to the order of things which are absolutely more intelligible than, and prior to, the species. For annul the genus and differentia, and the species too is annulled, so that these are prior to the species. They are also more intelligible; for if the species be known, the genus and differentia must of necessity be known as well (for any one who knows what a man is knows also what 'animal' and 'walking' are), whereas if the genus or the differentia be known it does not follow of necessity that the species is known as well: thus the species is less intelligible. Moreover, those who say that such definitions, viz. those which proceed from what is intelligible to this, that, or the other man, are really and truly definitions, will have to say that there are several definitions of one and the same thing. For, as it happens, different things are more intelligible to different people, not the same things to all; and so a different definition would have to be rendered to each several person, if the definition is to be constructed from what is more intelligible to particular individuals. Moreover, to the same people different things are more intelligible at different times; first of all the objects of sense; then, as they become more sharpwitted, the converse; so that those who hold that a definition ought to be rendered through what is more intelligible to particular individuals would not have to render the same definition at all times even to the same person. It is clear, then, that the right way to define is not through terms of that kind, but through what is absolutely more intelligible: for only in this way could the definition come always to be one and the same. Perhaps, also, what is absolutely intelligible is what is intelligible, not to all, but to those who are in a sound state of understanding, just as what is absolutely healthy is what is healthy to those in a sound state of body. All such points as this ought to be made very precise, and made use of in the course of discussion as occasion requires. The demolition of a definition will most surely win a general

approval if the definer happens to have framed his expression neither from what is absolutely more intelligible nor yet from what is so to us.

One form, then, of the failure to work through more intelligible terms is the exhibition of the prior through the posterior, as we remarked before.' Another form occurs if we find that the definition has been rendered of what is at rest and definite through what is indefinite and in motion: for what is still and definite is prior to what is indefinite and in motion.

Of the failure to use terms that are prior there are three forms:

(1) The first is when an opposite has been defined through its opposite, e.g.i. good through evil: for opposites are always simultaneous by nature. Some people think, also, that both are objects of the same science, so that the one is not even more intelligible than the other. One must, however, observe that it is perhaps not possible to define some things in any other way, e.g. the double without the half, and all the terms that are essentially relative: for in all such cases the essential being is the same as a certain relation to something, so that it is impossible to understand the one term without the other, and accordingly in the definition of the one the other too must be embraced. One ought to learn up all such points as these, and use them as occasion may seem to require.

(2) Another is – if he has used the term defined itself. This passes unobserved when the actual name of the object is not used, e.g. supposing any one had defined the sun as a star that appears by day'. For in bringing in 'day' he brings in the sun. To detect errors of this sort, exchange the word for its definition, e.g. the definition of 'day' as the 'passage of the sun over the earth'. Clearly, whoever has said 'the passage of the sun over the earth' has said 'the sun', so that in bringing in the 'day' he has brought in the sun.

(3) Again, see if he has defined one coordinate member of a division by another, e.g. 'an odd number' as 'that which is greater by one than an even number'. For the co-ordinate members of a division that are derived from the same genus are simultaneous by nature and 'odd' and 'even' are such terms: for both are differentiae of number.

Likewise also, see if he has defined a superior through a subordinate term, e.g. 'An «even number» is «a number divisible into halves»', or '«the good» is a «state of virtue» '. For 'half' is derived from 'two', and 'two' is an even number: virtue also is a kind of good, so that the latter terms are subordinate to the former. Moreover, in using the subordinate term one is bound to use the other as well: for whoever employs the term 'virtue' employs the term 'good', seeing that virtue is a certain kind of good: likewise, also, whoever employs the term 'half' employs the term 'even', for to be 'divided in half' means to be divided into two, and two is even.

5

Generally speaking, then, one commonplace rule relates to the failure to frame the expression by means of terms that are prior and more intelligible: and of this the subdivisions are those specified above. A second is, see whether, though the object is in a genus, it has not been placed in a genus. This sort of error is always found where the essence of the object does not stand first in the expression, e.g. the definition of 'body' as 'that which has three dimensions', or the definition of 'man', supposing any one to give it, as 'that which knows how to count': for it is not stated what it is that has three dimensions, or what it is that

knows how to count: whereas the genus is meant to indicate just this, and is submitted first of the terms in the definition.

Moreover, see if, while the term to be defined is used in relation to many things, he has failed to render it in relation to all of them; as (e.g.) if he define 'grammar' as the 'knowledge how to write from dictation': for he ought also to say that it is a knowledge how to read as well. For in rendering it as 'knowledge of writing' has no more defined it than by rendering it as 'knowledge of reading': neither in fact has succeeded, but only he who mentions both these things, since it is impossible that there should be more than one definition of the same thing. It is only, however, in some cases that what has been said corresponds to the actual state of things: in some it does not, e.g. all those terms which are not used essentially in relation to both things: as medicine is said to deal with the production of disease and health; for it is said essentially to do the latter, but the former only by accident: for it is absolutely alien to medicine to produce disease. Here, then, the man who renders medicine as relative to both of these things has not defined it any better than he who mentions the one only. In fact he has done it perhaps worse, for any one else besides the doctor is capable of producing disease.

Moreover, in a case where the term to be defined is used in relation to several things, see if he has rendered it as relative to the worse rather than to the better; for every form of knowledge and potentiality is generally thought to be relative to the best.

Again, if the thing in question be not placed in its own proper genus, one must examine it according to the elementary rules in regard to genera, as has been said before.'

Moreover, see if he uses language which transgresses the genera of the things he defines, defining, e.g. justice as a 'state that produces equality' or 'distributes what is equal': for by defining

it so he passes outside the sphere of virtue, and so by leaving out the genus of justice he fails to express its essence: for the essence of a thing must in each case bring in its genus. It is the same thing if the object be not put into its nearest genus; for the man who puts it into the nearest one has stated all the higher genera, seeing that all the higher genera are predicated of the lower. Either, then, it ought to be put into its nearest genus, or else to the higher genus all the differentiae ought to be appended whereby the nearest genus is defined. For then he would not have left out anything: but would merely have mentioned the subordinate genus by an expression instead of by name. On the other hand, he who mentions merely the higher genus by itself, does not state the subordinate genus as well: in saying 'plant' a man does not specify 'a tree'.

6

Again, in regard to the differentiae, we must examine in like manner whether the differentiae, too, that he has stated be those of the genus. For if a man has not defined the object by the differentiae peculiar to it, or has mentioned something such as is utterly incapable of being a differentia of anything, e.g. 'animal' or 'substance', clearly he has not defined it at all: for the aforesaid terms do not differentiate anything at all. Further, we must see whether the differentia stated possesses anything that is co-ordinate with it in a division; for, if not, clearly the one stated could not be a differentia of the genus. For a genus is always divided by differentiae that are co-ordinate members of a division, as, for instance, by the terms 'walking', 'flying', 'aquatic', and 'biped'. Or see if, though the contrasted differentia exists, it yet is not true of the genus, for then, clearly, neither of them could be a differentia of the genus; for differentiae that

are co-ordinates in a division with the differentia of a thing are all true of the genus to which the thing belongs. Likewise, also, see if, though it be true, yet the addition of it to the genus fails to make a species. For then, clearly, this could not be a specific differentia of the genus: for a specific differentia, if added to the genus, always makes a species. If, however, this be no true differentia, no more is the one adduced, seeing that it is a co-ordinate member of a division with this.

Moreover, see if he divides the genus by a negation, as those do who define line as ‘length without breadth’: for this means simply that it has not any breadth. The genus will then be found to partake of its own species: for, since of everything either an affirmation or its negation is true, length must always either lack breadth or possess it, so that ‘length’ as well, i.e. the genus of ‘line’, will be either with or without breadth. But ‘length without breadth’ is the definition of a species, as also is ‘length with breadth’: for ‘without breadth’ and ‘with breadth’ are differentiae, and the genus and differentia constitute the definition of the species. Hence the genus would admit of the definition of its species. Likewise, also, it will admit of the definition of the differentia, seeing that one or the other of the aforesaid differentiae is of necessity predicated of the genus. The usefulness of this principle is found in meeting those who assert the existence of ‘Ideas’: for if absolute length exist, how will it be predicable of the genus that it has breadth or that it lacks it? For one assertion or the other will have to be true of ‘length’ universally, if it is to be true of the genus at all: and this is contrary to the fact: for there exist both lengths which have, and lengths which have not, breadth. Hence the only people against whom the rule can be employed are those who assert that a genus is always numerically one; and this is what is done by those who assert the real existence of the ‘Ideas’; for they allege that absolute length and absolute animal are the genus.

It may be that in some cases the definer is obliged to employ a negation as well, e.g. in defining privations. For 'blind' means a thing which cannot see when its nature is to see. There is no difference between dividing the genus by a negation, and dividing it by such an affirmation as is bound to have a negation as its co-ordinate in a division, e.g. supposing he had defined something as 'length possessed of breadth'; for co-ordinate in the division with that which is possessed of breadth is that which possesses no breadth and that only, so that again the genus is divided by a negation.

Again, see if he rendered the species as a differentia, as do those who define 'contumely' as 'insolence accompanied by jeering'; for jeering is a kind of insolence, i.e. it is a species and not a differentia.

Moreover, see if he has stated the genus as the differentia, e.g. 'Virtue is a good or noble state: for 'good' is the genus of 'virtue'. Or possibly 'good' here is not the genus but the differentia, on the principle that the same thing cannot be in two genera of which neither contains the other: for 'good' does not include 'state', nor vice versa: for not every state is good nor every good a 'state'. Both, then, could not be genera, and consequently, if 'state' is the genus of virtue, clearly 'good' cannot be its genus: it must rather be the differentia'. Moreover, 'a state' indicates the essence of virtue, whereas 'good' indicates not the essence but a quality: and to indicate a quality is generally held to be the function of the differentia. See, further, whether the differentia rendered indicates an individual rather than a quality: for the general view is that the differentia always expresses a quality.

Look and see, further, whether the differentia belongs only by accident to the object defined. For the differentia is never an

accidental attribute, any more than the genus is: for the differentia of a thing cannot both belong and not belong to it.

Moreover, if either the differentia or the species, or any of the things which are under the species, is predicable of the genus, then he could not have defined the term. For none of the aforesaid can possibly be predicated of the genus, seeing that the genus is the term with the widest range of all. Again, see if the genus be predicated of the differentia; for the general view is that the genus is predicated, not of the differentia, but of the objects of which the differentia is predicated. Animal (e.g.) is predicated of 'man' or 'ox' or other walking animals, not of the actual differentia itself which we predicate of the species. For if 'animal' is to be predicated of each of its differentiae, then 'animal' would be predicated of the species several times over; for the differentiae are predicates of the species. Moreover, the differentiae will be all either species or individuals, if they are animals; for every animal is either a species or an individual.

Likewise you must inquire also if the species or any of the objects that come under it is predicated of the differentia: for this is impossible, seeing that the differentia is a term with a wider range than the various species. Moreover, if any of the species be predicated of it, the result will be that the differentia is a species: if, for instance, 'man' be predicated, the differentia is clearly the human race. Again, see if the differentia fails to be prior to the species: for the differentia ought to be posterior to the genus, but prior to the species.

Look and see also if the differentia mentioned belongs to a different genus, neither contained in nor containing the genus in question. For the general view is that the same differentia cannot be used of two non-subaltern genera. Else the result will be that the same species as well will be in two non-subaltern genera: for each of the differentiae imports its own genus, e.g.

‘walking’ and ‘biped’ import with them the genus ‘animal’. If, then, each of the genera as well is true of that of which the differentia is true, it clearly follows that the species must be in two non-subaltern genera. Or perhaps it is not impossible for the same differentia to be used of two non-subaltern genera, and we ought to add the words ‘except they both be subordinate members of the same genus’. Thus ‘walking animal’ and ‘flying animal’ are non-subaltern genera, and ‘biped’ is the differentia of both. The words ‘except they both be subordinate members of the same genus’ ought therefore to be added; for both these are subordinate to ‘animal’. From this possibility, that the same differentia may be used of two non-subaltern genera, it is clear also that there is no necessity for the differentia to carry with it the whole of the genus to which it belongs, but only the one or the other of its limbs together with the genera that are higher than this, as ‘biped’ carries with it either ‘flying’ or ‘walking animal’.

See, too, if he has rendered ‘existence in’ something as the differentia of a thing’s essence: for the general view is that locality cannot differentiate between one essence and another. Hence, too, people condemn those who divide animals by means of the terms ‘walking’ and ‘aquatic’, on the ground that ‘walking’ and ‘aquatic’ indicate mere locality. Or possibly in this case the censure is undeserved; for ‘aquatic’ does not mean ‘in’ anything; nor does it denote a locality, but a certain quality: for even if the thing be on the dry land, still it is aquatic: and likewise a land-animal, even though it be in the water, will still be a and not an aquatic-animal. But all the same, if ever the differentia does denote existence in something, clearly he will have made a bad mistake.

Again, see if he has rendered an affection as the differentia: for every affection, if intensified, subverts the essence of the thing, while the differentia is not of that kind: for the differentia is

generally considered rather to preserve that which it differentiates; and it is absolutely impossible for a thing to exist without its own special differentia: for if there be no 'walking', there will be no 'man'. In fact, we may lay down absolutely that a thing cannot have as its differentia anything in respect of which it is subject to alteration: for all things of that kind, if intensified, destroy its essence. If, then, a man has rendered any differentia of this kind, he has made a mistake: for we undergo absolutely no alteration in respect of our differentiae.

Again, see if he has failed to render the differentia of a relative term relatively to something else; for the differentiae of relative terms are themselves relative, as in the case also of knowledge. This is classed as speculative, practical and productive; and each of these denotes a relation: for it speculates upon something, and produces something and does something.

Look and see also if the definer renders each relative term relatively to its natural purpose: for while in some cases the particular relative term can be used in relation to its natural purpose only and to nothing else, some can be used in relation to something else as well. Thus sight can only be used for seeing, but a strigil can also be used to dip up water. Still, if any one were to define a strigil as an instrument for dipping water, he has made a mistake: for that is not its natural function. The definition of a thing's natural function is 'that for which it would be used by the prudent man, acting as such, and by the science that deals specially with that thing'.

Or see if, whenever a term happens to be used in a number of relations, he has failed to introduce it in its primary relation: e.g. by defining 'wisdom' as the virtue of 'man' or of the 'soul,' rather than of the 'reasoning faculty': for 'wisdom' is the virtue primarily of the reasoning faculty: for it is in virtue of this that both the man and his soul are said to be wise.

Moreover, if the thing of which the term defined has been stated to be an affection or disposition, or whatever it may be, be unable to admit it, the definer has made a mistake. For every disposition and every affection is formed naturally in that of which it is an affection or disposition, as knowledge, too, is formed in the soul, being a disposition of soul. Sometimes, however, people make bad mistakes in matters of this sort, e.g. all those who say that 'sleep' is a 'failure of sensation', or that 'perplexity' is a state of 'equality between contrary reasonings', or that 'pain' is a 'violent disruption of parts that are naturally conjoined'. For sleep is not an attribute of sensation, whereas it ought to be, if it is a failure of sensation. Likewise, perplexity is not an attribute of opposite reasonings, nor pain of parts naturally conjoined: for then inanimate things will be in pain, since pain will be present in them. Similar in character, too, is the definition of 'health', say, as a 'balance of hot and cold elements': for then health will be necessarily exhibited by the hot and cold elements: for balance of anything is an attribute inherent in those things of which it is the balance, so that health would be an attribute of them. Moreover, people who define in this way put effect for cause, or cause for effect. For the disruption of parts naturally conjoined is not pain, but only a cause of pain: nor again is a failure of sensation sleep, but the one is the cause of the other: for either we go to sleep because sensation fails, or sensation fails because we go to sleep. Likewise also an equality between contrary reasonings would be generally considered to be a cause of perplexity: for it is when we reflect on both sides of a question and find everything alike to be in keeping with either course that we are perplexed which of the two we are to do.

Moreover, with regard to all periods of time look and see whether there be any discrepancy between the differentia and the thing defined: e.g. supposing the 'immortal' to be defined as a 'living thing immune at present from destruction'. For a living

thing that is immune ‘at present’ from destruction will be immortal ‘at present’. Possibly, indeed, in this case this result does not follow, owing to the ambiguity of the words ‘immune at present from destruction’: for it may mean either that the thing has not been destroyed at present, or that it cannot be destroyed at present, or that at present it is such that it never can be destroyed. Whenever, then, we say that a living thing is at present immune from destruction, we mean that it is at present a living thing of such a kind as never to be destroyed: and this is equivalent to saying that it is immortal, so that it is not meant that it is immortal only at present. Still, if ever it does happen that what has been rendered according to the definition belongs in the present only or past, whereas what is meant by the word does not so belong, then the two could not be the same. So, then, this commonplace rule ought to be followed, as we have said.

7

You should look and see also whether the term being defined is applied in consideration of something other than the definition rendered. Suppose (e.g.) a definition of ‘justice’ as the ‘ability to distribute what is equal’. This would not be right, for ‘just’ describes rather the man who chooses, than the man who is able to distribute what is equal: so that justice could not be an ability to distribute what is equal: for then also the most just man would be the man with the most ability to distribute what is equal.

Moreover, see if the thing admits of degrees, whereas what is rendered according to the definition does not, or, vice versa, what is rendered according to the definition admits of degrees

while the thing does not. For either both must admit them or else neither, if indeed what is rendered according to the definition is the same as the thing. Moreover, see if, while both of them admit of degrees, they yet do not both become greater together: e.g. suppose sexual love to be the desire for intercourse: for he who is more intensely in love has not a more intense desire for intercourse, so that both do not become intensified at once: they certainly should, however, had they been the same thing.

Moreover, suppose two things to be before you, see if the term to be defined applies more particularly to the one to which the content of the definition is less applicable. Take, for instance, the definition of 'fire' as the 'body that consists of the most rarefied particles'. For 'fire' denotes flame rather than light, but flame is less the body that consists of the most rarefied particles than is light: whereas both ought to be more applicable to the same thing, if they had been the same. Again, see if the one expression applies alike to both the objects before you, while the other does not apply to both alike, but more particularly to one of them.

Moreover, see if he renders the definition relative to two things taken separately: thus, the beautiful' is 'what is pleasant to the eyes or to the ears»: or 'the real' is 'what is capable of being acted upon or of acting'. For then the same thing will be both beautiful and not beautiful, and likewise will be both real and not real. For 'pleasant to the ears' will be the same as 'beautiful', so that 'not pleasant to the ears' will be the same as 'not beautiful': for of identical things the opposites, too, are identical, and the opposite of 'beautiful' is 'not beautiful', while of 'pleasant to the ears' the opposite is not pleasant to the cars': clearly, then, 'not pleasant to the ears' is the same thing as 'not beautiful'. If, therefore, something be pleasant to the eyes but not to the ears, it will be both beautiful and not beautiful. In like

manner we shall show also that the same thing is both real and unreal.

Moreover, of both genera and differentiae and all the other terms rendered in definitions you should frame definitions in lieu of the terms, and then see if there be any discrepancy between them.

8

If the term defined be relative, either in itself or in respect of its genus, see whether the definition fails to mention that to which the term, either in itself or in respect of its genus, is relative, e.g. if he has defined 'knowledge' as an 'incontrovertible conception' or 'wishing' as 'painless conation'. For of everything relative the essence is relative to something else, seeing that the being of every relative term is identical with being in a certain relation to something. He ought, therefore, to have said that knowledge is 'conception of a knowable' and that wishing is 'conation for a good'. Likewise, also, if he has defined 'grammar' as 'knowledge of letters': whereas in the definition there ought to be rendered either the thing to which the term itself is relative, or that, whatever it is, to which its genus is relative. Or see if a relative term has been described not in relation to its end, the end in anything being whatever is best in it or gives its purpose to the rest. Certainly it is what is best or final that should be stated, e.g. that desire is not for the pleasant but for pleasure: for this is our purpose in choosing what is pleasant as well.

Look and see also if that in relation to which he has rendered the term be a process or an activity: for nothing of that kind is an end, for the completion of the activity or process is the end rather than the process or activity itself. Or perhaps this rule is

not true in all cases, for almost everybody prefers the present experience of pleasure to its cessation, so that they would count the activity as the end rather than its completion.

Again see in some cases if he has failed to distinguish the quantity or quality or place or other differentiae of an object; e.g. the quality and quantity of the honour the striving for which makes a man ambitious: for all men strive for honour, so that it is not enough to define the ambitious man as him who strives for honour, but the aforesaid differentiae must be added. Likewise, also, in defining the covetous man the quantity of money he aims at, or in the case of the incontinent man the quality of the pleasures, should be stated. For it is not the man who gives way to any sort of pleasure whatever who is called incontinent, but only he who gives way to a certain kind of pleasure. Or again, people sometimes define night as a 'shadow on the earth', or an earthquake as a movement of the earth', or a cloud as 'condensation of the air', or a wind as a 'movement of the air'; whereas they ought to specify as well quantity, quality, place, and cause. Likewise, also, in other cases of the kind: for by omitting any differentiae whatever he fails to state the essence of the term. One should always attack deficiency. For a movement of the earth does not constitute an earthquake, nor a movement of the air a wind, irrespective of its manner and the amount involved.

Moreover, in the case of conations, and in any other cases where it applies, see if the word 'apparent' is left out, e.g. 'wishing is a conation after the good', or 'desire is a conation after the pleasant' – instead of saying 'the apparently good', or 'pleasant'. For often those who exhibit the conation do not perceive what is good or pleasant, so that their aim need not be really good or pleasant, but only apparently so. They ought, therefore, to have rendered the definition also accordingly. On the other hand, any one who maintains the existence of Ideas

ought to be brought face to face with his Ideas, even though he does render the word in question: for there can be no Idea of anything merely apparent: the general view is that an Idea is always spoken of in relation to an Idea: thus absolute desire is for the absolutely pleasant, and absolute wishing is for the absolutely good; they therefore cannot be for an apparent good or an apparently pleasant: for the existence of an absolutely – apparently – good or pleasant would be an absurdity.

9

Moreover, if the definition be of the state of anything, look at what is in the state, while if it be of what is in the state, look at the state: and likewise also in other cases of the kind. Thus if the pleasant be identical with the beneficial, then, too, the man who is pleased is benefited. Speaking generally, in definitions of this sort it happens that what the definer defines is in a sense more than one thing: for in defining knowledge, a man in a sense defines ignorance as well, and likewise also what has knowledge and what lacks it, and what it is to know and to be ignorant. For if the first be made clear, the others become in a certain sense clear as well. We have, then, to be on our guard in all such cases against discrepancy, using the elementary principles drawn from consideration of contraries and of coordinates.

Moreover, in the case of relative terms, see if the species is rendered as relative to a species of that to which the genus is rendered as relative, e.g. supposing belief to be relative to some object of belief, see whether a particular belief is made relative to some particular object of belief: and, if a multiple be relative to a fraction, see whether a particular multiple be made relative

to a particular fraction. For if it be not so rendered, clearly a mistake has been made.

See, also, if the opposite of the term has the opposite definition, whether (e.g.) the definition of 'half' is the opposite of that of 'double': for if 'double' is 'that which exceeds another by an equal amount to that other', 'half' is 'that which is exceeded by an amount equal to itself'. In the same way, too, with contraries. For to the contrary term will apply the definition that is contrary in some one of the ways in which contraries are conjoined. Thus (e.g.) if 'useful'='productive of good', 'injurious'=productive of evil' or 'destructive of good', for one or the other of thee is bound to be contrary to the term originally used. Suppose, then, neither of these things to be the contrary of the term originally used, then clearly neither of the definitions rendered later could be the definition of the contrary of the term originally defined: and therefore the definition originally rendered of the original term has not been rightly rendered either. Seeing, moreover, that of contraries, the one is sometimes a word forced to denote the privation of the other, as (e.g.) inequality is generally held to be the privation of equality (for 'unequal' merely describes things that are not equal'), it is therefore clear that that contrary whose form denotes the privation must of necessity be defined through the other; whereas the other cannot then be defined through the one whose form denotes the privation; for else we should find that each is being interpreted by the other. We must in the case of contrary terms keep an eye on this mistake, e.g. supposing any one were to define equality as the contrary of inequality: for then he is defining it through the term which denotes privation of it. Moreover, a man who so defines is bound to use in his definition the very term he is defining; and this becomes clear, if for the word we substitute its definition. For to say 'inequality' is the same as to say 'privation of equality'. Therefore equality so defined will be 'the contrary of the privation of equality', so

that he would have used the very word to be defined. Suppose, however, that neither of the contraries be so formed as to denote privation, but yet the definition of it be rendered in a manner like the above, e.g. suppose ‘good’ to be defined as ‘the contrary of evil’, then, since it is clear that ‘evil’ too will be ‘the contrary of good’ (for the definition of things that are contrary in this must be rendered in a like manner), the result again is that he uses the very term being defined: for ‘good’ is inherent in the definition of ‘evil’. If, then, ‘good’ be the contrary of evil, and evil be nothing other than the ‘contrary of good’, then ‘good’ will be the ‘contrary of the contrary of good’. Clearly, then, he has used the very word to be defined.

Moreover, see if in rendering a term formed to denote privation, he has failed to render the term of which it is the privation, e.g. the state, or contrary, or whatever it may be whose privation it is: also if he has omitted to add either any term at all in which the privation is naturally formed, or else that in which it is naturally formed primarily, e.g. whether in defining ‘ignorance’ a privation he has failed to say that it is the privation of ‘knowledge’; or has failed to add in what it is naturally formed, or, though he has added this, has failed to render the thing in which it is primarily formed, placing it (e.g.) in ‘man’ or in ‘the soul’, and not in the ‘reasoning faculty’: for if in any of these respects he fails, he has made a mistake. Likewise, also, if he has failed to say that ‘blindness’ is the ‘privation of sight in an eye’: for a proper rendering of its essence must state both of what it is the privation and what it is that is deprived.

Examine further whether he has defined by the expression ‘a privation’ a term that is not used to denote a privation: thus a mistake of this sort also would be generally thought to be incurred in the case of ‘error’ by any one who is not using it as a merely negative term. For what is generally thought to be in error is not that which has no knowledge, but rather that which

has been deceived, and for this reason we do not talk of inanimate things or of children as 'erring'. 'Error', then, is not used to denote a mere privation of knowledge.

10

Moreover, see whether the like inflexions in the definition apply to the like inflexions of the term; e.g. if 'beneficial' means 'productive of health', does 'beneficially' mean productively of health' and a 'benefactor' a 'producer of health'?

Look too and see whether the definition given will apply to the Idea as well. For in some cases it will not do so; e.g. in the Platonic definition where he adds the word 'mortal' in his definitions of living creatures: for the Idea (e.g. the absolute Man) is not mortal, so that the definition will not fit the Idea. So always wherever the words 'capable of acting on' or 'capable of being acted upon' are added, the definition and the Idea are absolutely bound to be discrepant: for those who assert the existence of Ideas hold that they are incapable of being acted upon, or of motion. In dealing with these people even arguments of this kind are useful.

Further, see if he has rendered a single common definition of terms that are used ambiguously. For terms whose definition corresponding their common name is one and the same, are synonymous; if, then, the definition applies in a like manner to the whole range of the ambiguous term, it is not true of any one of the objects described by the term. This is, moreover, what happens to Dionysius' definition of 'life' when stated as 'a movement of a creature sustained by nutriment, congenitally present with it': for this is found in plants as much as in animals, whereas 'life' is generally understood to mean not one

kind of thing only, but to be one thing in animals and another in plants. It is possible to hold the view that life is a synonymous term and is always used to describe one thing only, and therefore to render the definition in this way on purpose: or it may quite well happen that a man may see the ambiguous character of the word, and wish to render the definition of the one sense only, and yet fail to see that he has rendered a definition common to both senses instead of one peculiar to the sense he intends. In either case, whichever course he pursues, he is equally at fault. Since ambiguous terms sometimes pass unobserved, it is best in questioning to treat such terms as though they were synonymous (for the definition of the one sense will not apply to the other, so that the answerer will be generally thought not to have defined it correctly, for to a synonymous term the definition should apply in its full range), whereas in answering you should yourself distinguish between the senses. Further, as some answerers call 'ambiguous' what is really synonymous, whenever the definition rendered fails to apply universally, and, vice versa, call synonymous what is really ambiguous supposing their definition applies to both senses of the term, one should secure a preliminary admission on such points, or else prove beforehand that so-and-so is ambiguous or synonymous, as the case may be: for people are more ready to agree when they do not foresee what the consequence will be. If, however, no admission has been made, and the man asserts that what is really synonymous is ambiguous because the definition he has rendered will not apply to the second sense as well, see if the definition of this second meaning applies also to the other meanings: for if so, this meaning must clearly be synonymous with those others. Otherwise, there will be more than one definition of those other meanings, for there are applicable to them two distinct definitions in explanation of the term, viz. the one previously rendered and also the later one. Again, if any one were to define

a term used in several senses, and, finding that his definition does not apply to them all, were to contend not that the term is ambiguous, but that even the term does not properly apply to all those senses, just because his definition will not do so either, then one may retort to such a man that though in some things one must not use the language of the people, yet in a question of terminology one is bound to employ the received and traditional usage and not to upset matters of that sort.

11

Suppose now that a definition has been rendered of some complex term, take away the definition of one of the elements in the complex, and see if also the rest of the definition defines the rest of it: if not, it is clear that neither does the whole definition define the whole complex. Suppose, e.g. that some one has defined a 'finite straight line' as 'the limit of a finite plane, such that its centre is in a line with its extremes'; if now the definition of a finite line' be the 'limit of a finite plane', the rest (viz. 'such that its centre is in a line with its extremes') ought to be a definition of straight'. But an infinite straight line has neither centre nor extremes and yet is straight so that this remainder does not define the remainder of the term.

Moreover, if the term defined be a compound notion, see if the definition rendered be equimembral with the term defined. A definition is said to be equimembral with the term defined when the number of the elements compounded in the latter is the same as the number of nouns and verbs in the definition. For the exchange in such cases is bound to be merely one of term for term, in the case of some if not of all, seeing that there are no more terms used now than formerly; whereas in a

definition terms ought to be rendered by phrases, if possible in every case, or if not, in the majority. For at that rate, simple objects too could be defined by merely calling them by a different name, e.g. ‘cloak’ instead of ‘doublet’.

The mistake is even worse, if actually a less well known term be substituted, e.g. ‘pellucid mortal’ for ‘white man’: for it is no definition, and moreover is less intelligible when put in that form.

Look and see also whether, in the exchange of words, the sense fails still to be the same. Take, for instance, the explanation of ‘speculative knowledge’ as ‘speculative conception’: for conception is not the same as knowledge – as it certainly ought to be if the whole is to be the same too: for though the word ‘speculative’ is common to both expressions, yet the remainder is different.

Moreover, see if in replacing one of the terms by something else he has exchanged the genus and not the differentia, as in the example just given: for ‘speculative’ is a less familiar term than knowledge; for the one is the genus and the other the differentia, and the genus is always the most familiar term of all; so that it is not this, but the differentia, that ought to have been changed, seeing that it is the less familiar. It might be held that this criticism is ridiculous: because there is no reason why the most familiar term should not describe the differentia, and not the genus; in which case, clearly, the term to be altered would also be that denoting the genus and not the differentia. If, however, a man is substituting for a term not merely another term but a phrase, clearly it is of the differentia rather than of the genus that a definition should be rendered, seeing that the object of rendering the definition is to make the subject familiar; for the differentia is less familiar than the genus.

If he has rendered the definition of the differentia, see whether the definition rendered is common to it and something else as well: e.g. whenever he says that an odd number is a 'number with a middle', further definition is required of how it has a middle: for the word 'number' is common to both expressions, and it is the word 'odd' for which the phrase has been substituted. Now both a line and a body have a middle, yet they are not 'odd'; so that this could not be a definition of 'odd'. If, on the other hand, the phrase 'with a middle' be used in several senses, the sense here intended requires to be defined. So that this will either discredit the definition or prove that it is no definition at all.

12

Again, see if the term of which he renders the definition is a reality, whereas what is contained in the definition is not, e.g. Suppose 'white' to be defined as 'colour mingled with fire': for what is bodiless cannot be mingled with body, so that 'colour' 'mingled with fire' could not exist, whereas 'white' does exist.

Moreover, those who in the case of relative terms do not distinguish to what the object is related, but have described it only so as to include it among too large a number of things, are wrong either wholly or in part; e.g. suppose some one to have defined 'medicine' as a science of Reality'. For if medicine be not a science of anything that is real, the definition is clearly altogether false; while if it be a science of some real thing, but not of another, it is partly false; for it ought to hold of all reality, if it is said to be of Reality essentially and not accidentally: as is the case with other relative terms: for every object of knowledge is a term relative to knowledge: likewise, also, with other

relative terms, inasmuch as all such are convertible. Moreover, if the right way to render account of a thing be to render it as it is not in itself but accidentally, then each and every relative term would be used in relation not to one thing but to a number of things. For there is no reason why the same thing should not be both real and white and good, so that it would be a correct rendering to render the object in relation to any one whatsoever of these, if to render what it is accidentally be a correct way to render it. It is, moreover, impossible that a definition of this sort should be peculiar to the term rendered: for not only but the majority of the other sciences too, have for their object some real thing, so that each will be a science of reality. Clearly, then, such a definition does not define any science at all; for a definition ought to be peculiar to its own term, not general.

Sometimes, again, people define not the thing but only the thing in a good or perfect condition. Such is the definition of a rhetorician as 'one who can always see what will persuade in the given circumstances, and omit nothing'; or of a thief, as 'one who pilfers in secret': for clearly, if they each do this, then the one will be a good rhetorician, and the other a good thief: whereas it is not the actual pilfering in secret, but the wish to do it, that constitutes the thief.

Again, see if he has rendered what is desirable for its own sake as desirable for what it produces or does, or as in any way desirable because of something else, e.g. by saying that justice is 'what preserves the laws' or that wisdom is 'what produces happiness'; for what produces or preserves something else is one of the things desirable for something else. It might be said that it is possible for what is desirable in itself to be desirable for something else as well: but still to define what is desirable in itself in such a way is none the less wrong: for the essence contains par excellence what is best in anything, and it is better for a thing to be desirable in itself than to be desirable for

something else, so that this is rather what the definition too ought to have indicated.

13

See also whether in defining anything a man has defined it as an ‘A and B’, or as a ‘product of A and B’ or as an ‘A+B’. If he defines it as and B’, the definition will be true of both and yet of neither of them; suppose, e.g. justice to be defined as ‘temperance and courage.’ For if of two persons each has one of the two only, both and yet neither will be just: for both together have justice, and yet each singly fails to have it. Even if the situation here described does not so far appear very absurd because of the occurrence of this kind of thing in other cases also (for it is quite possible for two men to have a mina between them, though neither of them has it by himself), yet least that they should have contrary attributes surely seems quite absurd; and yet this will follow if the one be temperate and yet a coward, and the other, though brave, be a profligate; for then both will exhibit both justice and injustice: for if justice be temperance and bravery, then injustice will be cowardice and profligacy. In general, too, all the ways of showing that the whole is not the same as the sum of its parts are useful in meeting the type just described; for a man who defines in this way seems to assert that the parts are the same as the whole. The arguments are particularly appropriate in cases where the process of putting the parts together is obvious, as in a house and other things of that sort: for there, clearly, you may have the parts and yet not have the whole, so that parts and whole cannot be the same.

If, however, he has said that the term being defined is not 'A and B' but the 'product of A and B', look and see in the first place if A and B cannot in the nature of things have a single product: for some things are so related to one another that nothing can come of them, e.g. a line and a number. Moreover, see if the term that has been defined is in the nature of things found primarily in some single subject, whereas the things which he has said produce it are not found primarily in any single subject, but each in a separate one. If so, clearly that term could not be the product of these things: for the whole is bound to be in the same things wherein its parts are, so that the whole will then be found primarily not in one subject only, but in a number of them. If, on the other hand, both parts and whole are found primarily in some single subject, see if that medium is not the same, but one thing in the case of the whole and another in that of the parts. Again, see whether the parts perish together with the whole: for it ought to happen, vice versa, that the whole perishes when the parts perish; when the whole perishes, there is no necessity that the parts should perish too. Or again, see if the whole be good or evil, and the parts neither, or, vice versa, if the parts be good or evil and the whole neither. For it is impossible either for a neutral thing to produce something good or bad, or for things good or bad to produce a neutral thing. Or again, see if the one thing is more distinctly good than the other is evil, and yet the product be no more good than evil, e.g. suppose shamelessness be defined as 'the product of courage and false opinion': here the goodness of courage exceeds the evil of false opinion; accordingly the product of these ought to have corresponded to this excess, and to be either good without qualification, or at least more good than evil. Or it may be that this does not necessarily follow, unless each be in itself good or bad; for many things that are productive are not good in themselves, but only in combination; or, per contra, they are good taken singly, and bad or neutral in

combination. What has just been said is most clearly illustrated in the case of things that make for health or sickness; for some drugs are such that each taken alone is good, but if they are both administered in a mixture, bad.

Again, see whether the whole, as produced from a better and worse, fails to be worse than the better and better than the worse element. This again, however, need not necessarily be the case, unless the elements compounded be in themselves good; if they are not, the whole may very well not be good, as in the cases just instanced.

Moreover, see if the whole be synonymous with one of the elements: for it ought not to be, any more than in the case of syllables: for the syllable is not synonymous with any of the letters of which it is made up.

Moreover, see if he has failed to state the manner of their composition: for the mere mention of its elements is not enough to make the thing intelligible. For the essence of any compound thing is not merely that it is a product of so-and-so, but that it is a product of them compounded in such and such a way, just as in the case of a house: for here the materials do not make a house irrespective of the way they are put together.

If a man has defined an object as 'A+B', the first thing to be said is that 'A+B' means the same either as 'A and B', or as the 'product of A and B.' for 'honey+water' means either the honey and the water, or the 'drink made of honey and water'. If, then, he admits that 'A+B' is + B' is the same as either of these two things, the same criticisms will apply as have already been given for meeting each of them. Moreover, distinguish between the different senses in which one thing may be said to be '+' another, and see if there is none of them in which A could be said to exist '+ B.' Thus e.g. supposing the expression to mean that they exist either in some identical thing capable of

containing them (as e.g. justice and courage are found in the soul), or else in the same place or in the same time, and if this be in no way true of the A and B in question, clearly the definition rendered could not hold of anything, as there is no possible way in which A can exist B'. If, however, among the various senses above distinguished, it be true that A and B are each found in the same time as the other, look and see if possibly the two are not used in the same relation. Thus e.g. suppose courage to have been defined as 'daring with right reasoning': here it is possible that the person exhibits daring in robbery, and right reasoning in regard to the means of health: but he may have 'the former quality+the latter' at the same time, and not as yet be courageous! Moreover, even though both be used in the same relation as well, e.g. in relation to medical treatment (for a man may exhibit both daring and right reasoning in respect of medical treatment), still, none the less, not even this combination of 'the one+the other 'makes him 'courageous'. For the two must not relate to any casual object that is the same, any more than each to a different object; rather, they must relate to the function of courage, e.g. meeting the perils of war, or whatever is more properly speaking its function than this.

Some definitions rendered in this form fail to come under the aforesaid division at all, e.g. a definition of anger as 'pain with a consciousness of being slighted'. For what this means to say is that it is because of a consciousness of this sort that the pain occurs; but to occur 'because of' a thing is not the same as to occur '+ a thing' in any of its aforesaid senses.

14

Again, if he have described the whole compounded as the 'composition' of these things (e.g. 'a living creature' as a 'composition of soul and body'), first of all see whether he has omitted to state the kind of composition, as (e.g.) in a definition of 'flesh' or 'bone' as the 'composition of fire, earth, and air'. For it is not enough to say it is a composition, but you should also go on to define the kind of composition: for these things do not form flesh irrespective of the manner of their composition, but when compounded in one way they form flesh, when in another, bone. It appears, moreover, that neither of the aforesaid substances is the same as a 'composition' at all: for a composition always has a decomposition as its contrary, whereas neither of the aforesaid has any contrary. Moreover, if it is equally probable that every compound is a composition or else that none is, and every kind of living creature, though a compound, is never a composition, then no other compound could be a composition either.

Again, if in the nature of a thing two contraries are equally liable to occur, and the thing has been defined through the one, clearly it has not been defined; else there will be more than one definition of the same thing; for how is it any more a definition to define it through this one than through the other, seeing that both alike are naturally liable to occur in it? Such is the definition of the soul, if defined as a substance capable of receiving knowledge: for it has a like capacity for receiving ignorance.

Also, even when one cannot attack the definition as a whole for lack of acquaintance with the whole, one should attack some part of it, if one knows that part and sees it to be incorrectly rendered: for if the part be demolished, so too is the whole definition. Where, again, a definition is obscure, one should first

of all correct and reshape it in order to make some part of it clear and get a handle for attack, and then proceed to examine it. For the answerer is bound either to accept the sense as taken by the questioner, or else himself to explain clearly whatever it is that his definition means. Moreover, just as in the assemblies the ordinary practice is to move an emendation of the existing law and, if the emendation is better, they repeal the existing law, so one ought to do in the case of definitions as well: one ought oneself to propose a second definition: for if it is seen to be better, and more indicative of the object defined, clearly the definition already laid down will have been demolished, on the principle that there cannot be more than one definition of the same thing.

In combating definitions it is always one of the chief elementary principles to take by oneself a happy shot at a definition of the object before one, or to adopt some correctly expressed definition. For one is bound, with the model (as it were) before one's eyes, to discern both any shortcoming in any features that the definition ought to have, and also any superfluous addition, so that one is better supplied with lines of attack.

As to definitions, then, let so much suffice.

Book VII

1

Whether two things are 'the same' or 'different', in the most literal of the meanings ascribed to 'sameness' (and we said' that 'the same' applies in the most literal sense to what is numerically one), may be examined in the light of their inflexions and coordinates and opposites. For if justice be the same as courage, then too the just man is the same as the brave man, and 'justly' is the same as 'bravely'. Likewise, too, in the case of their opposites: for if two things be the same, their opposites also will be the same, in any of the recognized forms of opposition. For it is the same thing to take the opposite of the one or that of the other, seeing that they are the same. Again it may be examined in the light of those things which tend to produce or to destroy the things in question of their formation and destruction, and in general of any thing that is related in like manner to each. For where things are absolutely the same, their formations and destructions also are the same, and so are the things that tend to produce or to destroy them. Look and see also, in a case where one of two things is said to be something or other in a superlative degree, if the other of these alleged identical things can also be described by a superlative in the same respect. Thus Xenocrates argues that the happy life and the good life are the same, seeing that of all forms of life the good life is the most desirable and so also is the happy life: for 'the most desirable' and the greatest' apply but to one thing.' Likewise also in other cases of the kind. Each, however, of the two things termed 'greatest' or most desirable' must be numerically one: otherwise no proof will have been given that they are the same; for it does not follow because Peloponnesians and Spartans are the bravest of the Greeks, that Peloponnesians are the same as Spartans, seeing that 'Peloponnesian' is not any one person nor yet 'Spartan'; it only follows that the one must be included under the other as 'Spartans' are under 'Peloponnesians': for otherwise, if the one

class be not included under the other, each will be better than the other. For then the Peloponnesians are bound to be better than the Spartans, seeing that the one class is not included under the other; for they are better than anybody else. Likewise also the Spartans must perforce be better than the Peloponnesians; for they too are better than anybody else; each then is better than the other! Clearly therefore what is styled 'best' and 'greatest' must be a single thing, if it is to be proved to be 'the same' as another. This also is why Xenocrates fails to prove his case: for the happy life is not numerically single, nor yet the good life, so that it does not follow that, because they are both the most desirable, they are therefore the same, but only that the one falls under the other.

Again, look and see if, supposing the one to be the same as something, the other also is the same as it: for if they be not both the same as the same thing, clearly neither are they the same as one another.

Moreover, examine them in the light of their accidents or of the things of which they are accidents: for any accident belonging to the one must belong also to the other, and if the one belong to anything as an accident, so must the other also. If in any of these respects there is a discrepancy, clearly they are not the same.

See further whether, instead of both being found in one class of predicates, the one signifies a quality and the other a quantity or relation. Again, see if the genus of each be not the same, the one being 'good' and the other evil', or the one being 'virtue' and the other 'knowledge': or see if, though the genus is the same, the differentiae predicted of either be not the same, the one (e.g.) being distinguished as a 'speculative' science, the other as a 'practical' science. Likewise also in other cases.

Moreover, from the point of view of 'degrees', see if the one admits an increase of degree but not the other, or if though both admit it, they do not admit it at the same time; just as it is not the case that a man desires intercourse more intensely, the more intensely he is in love, so that love and the desire for intercourse are not the same.

Moreover, examine them by means of an addition, and see whether the addition of each to the same thing fails to make the same whole; or if the subtraction of the same thing from each leaves a different remainder. Suppose (e.g.) that he has declared 'double a half' to be the same as 'a multiple of a half': then, subtracting the words 'a half' from each, the remainders ought to have signified the same thing: but they do not; for 'double' and 'a multiple of' do not signify the same thing.

Inquire also not only if some impossible consequence results directly from the statement made, that A and B are the same, but also whether it is possible for a supposition to bring it about; as happens to those who assert that 'empty' is the same as 'full of air': for clearly if the air be exhausted, the vessel will not be less but more empty, though it will no longer be full of air. So that by a supposition, which may be true or may be false (it makes no difference which), the one character is annulled and not the other, showing that they are not the same.

Speaking generally, one ought to be on the look-out for any discrepancy anywhere in any sort of predicate of each term, and in the things of which they are predicated. For all that is predicated of the one should be predicated also of the other, and of whatever the one is a predicate, the other should be a predicate of it as well.

Moreover, as 'sameness' is a term used in many senses, see whether things that are the same in one way are the same also in a different way. For there is either no necessity or even no

possibility that things that are the same specifically or generically should be numerically the same, and it is with the question whether they are or are not the same in that sense that we are concerned.

Moreover, see whether the one can exist without the other; for, if so, they could not be the same.

2

Such is the number of the commonplace rules that relate to 'sameness'. It is clear from what has been said that all the destructive commonplaces relating to sameness are useful also in questions of definition, as was said before:' for if what is signified by the term and by the expression be not the same, clearly the expression rendered could not be a definition. None of the constructive commonplaces, on the other hand, helps in the matter of definition; for it is not enough to show the sameness of content between the expression and the term, in order to establish that the former is a definition, but a definition must have also all the other characters already announced.

3

This then is the way, and these the arguments, whereby the attempt to demolish a definition should always be made. If, on the other hand, we desire to establish one, the first thing to observe is that few if any who engage in discussion arrive at a definition by reasoning: they always assume something of the kind as their starting points – both in geometry and in

arithmetic and the other studies of that kind. In the second place, to say accurately what a definition is, and how it should be given, belongs to another inquiry. At present it concerns us only so far as is required for our present purpose, and accordingly we need only make the bare statement that to reason to a thing's definition and essence is quite possible. For if a definition is an expression signifying the essence of the thing and the predicates contained therein ought also to be the only ones which are predicated of the thing in the category of essence; and genera and differentiae are so predicated in that category: it is obvious that if one were to get an admission that so and so are the only attributes predicated in that category, the expression containing so and so would of necessity be a definition; for it is impossible that anything else should be a definition, seeing that there is not anything else predicated of the thing in the category of essence.

That a definition may thus be reached by a process of reasoning is obvious. The means whereby it should be established have been more precisely defined elsewhere, but for the purposes of the inquiry now before us the same commonplace rules serve. For we have to examine into the contraries and other opposites of the thing, surveying the expressions used both as wholes and in detail: for if the opposite definition defines that opposite term, the definition given must of necessity be that of the term before us. Seeing, however, that contraries may be conjoined in more than one way, we have to select from those contraries the one whose contrary definition seems most obvious. The expressions, then, have to be examined each as a whole in the way we have said, and also in detail as follows. First of all, see that the genus rendered is correctly rendered; for if the contrary thing be found in the contrary genus to that stated in the definition, and the thing before you is not in that same genus, then it would clearly be in the contrary genus: for contraries must of necessity be either in the same genus or in contrary

genera. The differentiae, too, that are predicated of contraries we expect to be contrary, e.g. those of white and black, for the one tends to pierce the vision, while the other tends to compress it. So that if contrary differentiae to those in the definition are predicated of the contrary term, then those rendered in the definition would be predicated of the term before us. Seeing, then, that both the genus and the differentiae have been rightly rendered, clearly the expression given must be the right definition. It might be replied that there is no necessity why contrary differentiae should be predicated of contraries, unless the contraries be found within the same genus: of things whose genera are themselves contraries it may very well be that the same differentia is used of both, e.g. of justice and injustice; for the one is a virtue and the other a vice of the soul: 'of the soul', therefore, is the differentia in both cases, seeing that the body as well has its virtue and vice. But this much at least is true, that the differentiae of contraries are either contrary or else the same. If, then, the contrary differentia to that given be predicated of the contrary term and not of the one in hand, clearly the differentia stated must be predicated of the latter. Speaking generally, seeing that the definition consists of genus and differentiae, if the definition of the contrary term be apparent, the definition of the term before you will be apparent also: for since its contrary is found either in the same genus or in the contrary genus, and likewise also the differentiae predicated of opposites are either contrary to, or the same as, each other, clearly of the term before you there will be predicated either the same genus as of its contrary, while, of its differentiae, either all are contrary to those of its contrary, or at least some of them are so while the rest remain the same; or, vice versa, the differentiae will be the same and the genera contrary; or both genera and differentiae will be contrary. And that is all; for that both should be the same is not possible; else contraries will have the same definition.

Moreover, look at it from the point of view of its inflexions and coordinates. For genera and definitions are bound to correspond in either case. Thus if forgetfulness be the loss of knowledge, to forget is to lose knowledge, and to have forgotten is to have lost knowledge. If, then, any one whatever of these is agreed to, the others must of necessity be agreed to as well. Likewise, also, if destruction is the decomposition of the thing's essence, then to be destroyed is to have its essence decomposed, and 'destructively' means 'in such a way as to decompose its essence'; if again 'destructive' means 'apt to decompose something's essence', then also 'destruction' means 'the decomposition of its essence'. Likewise also with the rest: an admission of any one of them whatever, and all the rest are admitted too.

Moreover, look at it from the point of view of things that stand in relations that are like each other. For if 'healthy' means 'productive of health', 'vigorous' too will mean 'productive of vigour', and 'useful' will mean 'productive of good.' For each of these things is related in like manner to its own peculiar end, so that if one of them is defined as 'productive of' that end, this will also be the definition of each of the rest as well.

Moreover, look at it from the point of and like degrees, in all the ways in which it is possible to establish a result by comparing two and two together. Thus if A defines a better than B defines and B is a definition of so too is A of a. Further, if A's claim to define a is like B's to define B, and B defines B, then A too defines a. This examination from the point of view of greater degrees is of no use when a single definition is compared with two things, or two definitions with one thing; for there cannot possibly be one definition of two things or two of the same thing.

4

The most handy of all the commonplace arguments are those just mentioned and those from co-ordinates and inflexions, and these therefore are those which it is most important to master and to have ready to hand: for they are the most useful on the greatest number of occasions. Of the rest, too, the most important are those of most general application: for these are the most effective, e.g. that you should examine the individual cases, and then look to see in the case of their various species whether the definition applies. For the species is synonymous with its individuals. This sort of inquiry is of service against those who assume the existence of Ideas, as has been said before.' Moreover see if a man has used a term metaphorically, or predicated it of itself as though it were something different. So too if any other of the commonplace rules is of general application and effective, it should be employed.

5

That it is more difficult to establish than to overthrow a definition, is obvious from considerations presently to be urged. For to see for oneself, and to secure from those whom one is questioning, an admission of premisses of this sort is no simple matter, e.g. that of the elements of the definition rendered the one is genus and the other differentia, and that only the genus and differentiae are predicated in the category of essence. Yet without these premisses it is impossible to reason to a definition; for if any other things as well are predicated of the thing in the category of essence, there is no telling whether the formula stated or some other one is its definition, for a

definition is an expression indicating the essence of a thing. The point is clear also from the following: It is easier to draw one conclusion than many. Now in demolishing a definition it is sufficient to argue against one point only (for if we have overthrown any single point whatsoever, we shall have demolished the definition); whereas in establishing a definition, one is bound to bring people to the view that everything contained in the definition is attributable. Moreover, in establishing a case, the reasoning brought forward must be universal: for the definition put forward must be predicated of everything of which the term is predicated, and must moreover be convertible, if the definition rendered is to be peculiar to the subject. In overthrowing a view, on the other hand, there is no longer any necessity to show one's point universally: for it is enough to show that the formula is untrue of any one of the things embraced under the term.

Further, even supposing it should be necessary to overthrow something by a universal proposition, not even so is there any need to prove the converse of the proposition in the process of overthrowing the definition. For merely to show that the definition fails to be predicated of every one of the things of which the term is predicated, is enough to overthrow it universally: and there is no need to prove the converse of this in order to show that the term is predicated of things of which the expression is not predicated. Moreover, even if it applies to everything embraced under the term, but not to it alone, the definition is thereby demolished.

The case stands likewise in regard to the property and genus of a term also. For in both cases it is easier to overthrow than to establish. As regards the property this is clear from what has been said: for as a rule the property is rendered in a complex phrase, so that to overthrow it, it is only necessary to demolish one of the terms used, whereas to establish it is necessary to

reason to them all. Then, too, nearly all the other rules that apply to the definition will apply also to the property of a thing. For in establishing a property one has to show that it is true of everything included under the term in question, whereas to overthrow one it is enough to show in a single case only that it fails to belong: further, even if it belongs to everything falling under the term, but not to that only, it is overthrown in this case as well, as was explained in the case of the definition. In regard to the genus, it is clear that you are bound to establish it in one way only, viz. by showing that it belongs in every case, while of overthrowing it there are two ways: for if it has been shown that it belongs either never or not in a certain case, the original statement has been demolished. Moreover, in establishing a genus it is not enough to show that it belongs, but also that it belongs as genus has to be shown; whereas in overthrowing it, it is enough to show its failure to belong either in some particular case or in every case. It appears, in fact, as though, just as in other things to destroy is easier than to create, so in these matters too to overthrow is easier than to establish.

In the case of an accidental attribute the universal proposition is easier to overthrow than to establish; for to establish it, one has to show that it belongs in every case, whereas to overthrow it, it is enough to show that it does not belong in one single case. The particular proposition is, on the contrary, easier to establish than to overthrow: for to establish it, it is enough to show that it belongs in a particular instance, whereas to overthrow it, it has to be shown that it never belongs at all.

It is clear also that the easiest thing of all is to overthrow a definition. For on account of the number of statements involved we are presented in the definition with the greatest number of points for attack, and the more plentiful the material, the quicker an argument comes: for there is more likelihood of a mistake occurring in a large than in a small number of things.

Moreover, the other rules too may be used as means for attacking a definition: for if either the formula be not peculiar, or the genus rendered be the wrong one, or something included in the formula fail to belong, the definition is thereby demolished. On the other hand, against the others we cannot bring all of the arguments drawn from definitions, nor yet of the rest: for only those relating to accidental attributes apply generally to all the aforesaid kinds of attribute. For while each of the aforesaid kinds of attribute must belong to the thing in question, yet the genus may very well not belong as a property without as yet being thereby demolished. Likewise also the property need not belong as a genus, nor the accident as a genus or property, so long as they do belong. So that it is impossible to use one set as a basis of attack upon the other except in the case of definition. Clearly, then, it is the easiest of all things to demolish a definition, while to establish one is the hardest. For there one both has to establish all those other points by reasoning (i.e. that the attributes stated belong, and that the genus rendered is the true genus, and that the formula is peculiar to the term), and moreover, besides this, that the formula indicates the essence of the thing; and this has to be done correctly.

Of the rest, the property is most nearly of this kind: for it is easier to demolish, because as a rule it contains several terms; while it is the hardest to establish, both because of the number of things that people must be brought to accept, and, besides this, because it belongs to its subject alone and is predicated convertibly with its subject.

The easiest thing of all to establish is an accidental predicate: for in other cases one has to show not only that the predicate belongs, but also that it belongs in such and such a particular way: whereas in the case of the accident it is enough to show merely that it belongs. On the other hand, an accidental

predicate is the hardest thing to overthrow, because it affords the least material: for in stating accident a man does not add how the predicate belongs; and accordingly, while in other cases it is possible to demolish what is said in two ways, by showing either that the predicate does not belong, or that it does not belong in the particular way stated, in the case of an accidental predicate the only way to demolish it is to show that it does not belong at all.

The commonplace arguments through which we shall be well supplied with lines of argument with regard to our several problems have now been enumerated at about sufficient length.

Book VIII

1

Next there fall to be discussed the problems of arrangement and method in pitting questions. Any one who intends to frame questions must, first of all, select the ground from which he should make his attack; secondly, he must frame them and arrange them one by one to himself; thirdly and lastly, he must proceed actually to put them to the other party. Now so far as the selection of his ground is concerned the problem is one alike for the philosopher and the dialectician; but how to go on to arrange his points and frame his questions concerns the dialectician only: for in every problem of that kind a reference to another party is involved. Not so with the philosopher, and

the man who is investigating by himself: the premisses of his reasoning, although true and familiar, may be refused by the answerer because they lie too near the original statement and so he foresees what will follow if he grants them: but for this the philosopher does not care. Nay, he may possibly be even anxious to secure axioms as familiar and as near to the question in hand as possible: for these are the bases on which scientific reasonings are built up.

The sources from which one's commonplace arguments should be drawn have already been described:' we have now to discuss the arrangement and formation of questions and first to distinguish the premisses, other than the necessary premisses, which have to be adopted. By necessary premisses are meant those through which the actual reasoning is constructed. Those which are secured other than these are of four kinds; they serve either inductively to secure the universal premiss being granted, or to lend weight to the argument, or to conceal the conclusion, or to render the argument more clear. Beside these there is no other premiss which need be secured: these are the ones whereby you should try to multiply and formulate your questions. Those which are used to conceal the conclusion serve a controversial purpose only; but inasmuch as an undertaking of this sort is always conducted against another person, we are obliged to employ them as well.

The necessary premisses through which the reasoning is effected, ought not to be propounded directly in so many words. Rather one should soar as far aloof from them as possible. Thus if one desires to secure an admission that the knowledge of contraries is one, one should ask him to admit it not of contraries, but of opposites: for, if he grants this, one will then argue that the knowledge of contraries is also the same, seeing that contraries are opposites; if he does not, one should secure the admission by induction, by formulating a proposition to that

effect in the case of some particular pair of contraries. For one must secure the necessary premisses either by reasoning or by induction, or else partly by one and partly by the other, although any propositions which are too obvious to be denied may be formulated in so many words. This is because the coming conclusion is less easily discerned at the greater distance and in the process of induction, while at the same time, even if one cannot reach the required premisses in this way, it is still open to one to formulate them in so many words. The premisses, other than these, that were mentioned above, must be secured with a view to the latter. The way to employ them respectively is as follows: Induction should proceed from individual cases to the universal and from the known to the unknown; and the objects of perception are better known, to most people if not invariably. Concealment of one's plan is obtained by securing through prosyllogisms the premisses through which the proof of the original proposition is going to be constructed – and as many of them as possible. This is likely to be effected by making syllogisms to prove not only the necessary premisses but also some of those which are required to establish them. Moreover, do not state the conclusions of these premisses but draw them later one after another; for this is likely to keep the answerer at the greatest possible distance from the original proposition. Speaking generally, a man who desires to get information by a concealed method should so put his questions that when he has put his whole argument and has stated the conclusion, people still ask 'Well, but why is that?' This result will be secured best of all by the method above described: for if one states only the final conclusion, it is unclear how it comes about; for the answerer does not foresee on what grounds it is based, because the previous syllogisms have not been made articulate to him: while the final syllogism, showing the conclusion, is likely to be kept least articulate if we

lay down not the secured propositions on which it is based, but only the grounds on which we reason to them.

It is a useful rule, too, not to secure the admissions claimed as the bases of the syllogisms in their proper order, but alternately those that conduce to one conclusion and those that conduce to another; for, if those which go together are set side by side, the conclusion that will result from them is more obvious in advance.

One should also, wherever possible, secure the universal premiss by a definition relating not to the precise terms themselves but to their co-ordinates; for people deceive themselves, whenever the definition is taken in regard to a co-ordinate, into thinking that they are not making the admission universally. An instance would be, supposing one had to secure the admission that the angry man desires vengeance on account of an apparent slight, and were to secure this, that 'anger' is a desire for vengeance on account of an apparent slight: for, clearly, if this were secured, we should have universally what we intend. If, on the other hand, people formulate propositions relating to the actual terms themselves, they often find that the answerer refuses to grant them because on the actual term itself he is readier with his objection, e.g. that the 'angry man' does not desire vengeance, because we become angry with our parents, but we do not desire vengeance on them. Very likely the objection is not valid; for upon some people it is vengeance enough to cause them pain and make them sorry; but still it gives a certain plausibility and air of reasonableness to the denial of the proposition. In the case, however, of the definition of 'anger' it is not so easy to find an objection.

Moreover, formulate your proposition as though you did so not for its own sake, but in order to get at something else: for people

are shy of granting what an opponent's case really requires. Speaking generally, a questioner should leave it as far as possible doubtful whether he wishes to secure an admission of his proposition or of its opposite: for if it be uncertain what their opponent's argument requires, people are more ready to say what they themselves think.

Moreover, try to secure admissions by means of likeness: for such admissions are plausible, and the universal involved is less patent; e.g. make the other person admit that as knowledge and ignorance of contraries is the same, so too perception of contraries is the same; or vice versa, that since the perception is the same, so is the knowledge also. This argument resembles induction, but is not the same thing; for in induction it is the universal whose admission is secured from the particulars, whereas in arguments from likeness, what is secured is not the universal under which all the like cases fall.

It is a good rule also, occasionally to bring an objection against oneself: for answerers are put off their guard against those who appear to be arguing impartially. It is useful too, to add that 'So and so is generally held or commonly said'; for people are shy of upsetting the received opinion unless they have some positive objection to urge: and at the same time they are cautious about upsetting such things because they themselves too find them useful. Moreover, do not be insistent, even though you really require the point: for insistence always arouses the more opposition. Further, formulate your premiss as though it were a mere illustration: for people admit the more readily a proposition made to serve some other purpose, and not required on its own account. Moreover, do not formulate the very proposition you need to secure, but rather something from which that necessarily follows: for people are more willing to admit the latter, because it is not so clear from this what the result will be, and if the one has been secured, the other has

been secured also. Again, one should put last the point which one most wishes to have conceded; for people are specially inclined to deny the first questions put to them, because most people in asking questions put first the points which they are most eager to secure. On the other hand, in dealing with some people propositions of this sort should be put forward first: for ill-tempered men admit most readily what comes first, unless the conclusion that will result actually stares them in the face, while at the close of an argument they show their ill-temper. Likewise also with those who consider themselves smart at answering: for when they have admitted most of what you want they finally talk clap-trap to the effect that the conclusion does not follow from their admissions: yet they say 'Yes' readily, confident in their own character, and imagining that they cannot suffer any reverse. Moreover, it is well to expand the argument and insert things that it does not require at all, as do those who draw false geometrical figures: for in the multitude of details the whereabouts of the fallacy is obscured. For this reason also a questioner sometimes evades observation as he adds in a corner what, if he formulated it by itself, would not be granted.

For concealment, then, the rules which should be followed are the above. Ornament is attained by induction and distinction of things closely akin. What sort of process induction is obvious: as for distinction, an instance of the kind of thing meant is the distinction of one form of knowledge as better than another by being either more accurate, or concerned with better objects; or the distinction of sciences into speculative, practical, and productive. For everything of this kind lends additional ornament to the argument, though there is no necessity to say them, so far as the conclusion goes.

For clearness, examples and comparisons should be adduced, and let the illustrations be relevant and drawn from things that

we know, as in Homer and not as in Choerilus; for then the proposition is likely to become clearer.

2

In dialectics, syllogism should be employed in reasoning against dialecticians rather than against the crowd: induction, on the other hand, is most useful against the crowd. This point has been treated previously as well.' In induction, it is possible in some cases to ask the question in its universal form, but in others this is not easy, because there is no established general term that covers all the resemblances: in this case, when people need to secure the universal, they use the phrase 'in all cases of this sort'. But it is one of the very hardest things to distinguish which of the things adduced are 'of this sort', and which are not: and in this connexion people often throw dust in each others' eyes in their discussion, the one party asserting the likeness of things that are not alike, and the other disputing the likeness of things that are. One ought, therefore, to try oneself to coin a word to cover all things of the given sort, so as to leave no opportunity either to the answerer to dispute, and say that the thing advanced does not answer to a like description, or to the questioner to suggest falsely that it does answer to a like description, for many things appear to answer to like descriptions that do not really do so.

If one has made an induction on the strength of several cases and yet the answerer refuses to grant the universal proposition, then it is fair to demand his objection. But until one has oneself stated in what cases it is so, it is not fair to demand that he shall say in what cases it is not so: for one should make the induction first, and then demand the objection. One ought,

moreover, to claim that the objections should not be brought in reference to the actual subject of the proposition, unless that subject happen to be the one and only thing of the kind, as for instance two is the one prime number among the even numbers: for, unless he can say that this subject is unique of its kind, the objector ought to make his objection in regard to some other. People sometimes object to a universal proposition, and bring their objection not in regard to the thing itself, but in regard to some homonym of it: thus they argue that a man can very well have a colour or a foot or a hand other than his own, for a painter may have a colour that is not his own, and a cook may have a foot that is not his own. To meet them, therefore, you should draw the distinction before putting your question in such cases: for so long as the ambiguity remains undetected, so long will the objection to the proposition be deemed valid. If, however, he checks the series of questions by an objection in regard not to some homonym, but to the actual thing asserted, the questioner should withdraw the point objected to, and form the remainder into a universal proposition, until he secures what he requires; e.g. in the case of forgetfulness and having forgotten: for people refuse to admit that the man who has lost his knowledge of a thing has forgotten it, because if the thing alters, he has lost knowledge of it, but he has not forgotten it. Accordingly the thing to do is to withdraw the part objected to, and assert the remainder, e.g. that if a person have lost knowledge of a thing while it still remains, he then has forgotten it. One should similarly treat those who object to the statement that 'the greater the good, the greater the evil that is its opposite': for they allege that health, which is a less good thing than vigour, has a greater evil as its opposite: for disease is a greater evil than debility. In this case too, therefore, we have to withdraw the point objected to; for when it has been withdrawn, the man is more likely to admit the proposition, e.g. that 'the greater good has the greater evil as its opposite, unless

the one good involves the other as well', as vigour involves health. This should be done not only when he formulates an objection, but also if, without so doing, he refuses to admit the point because he foresees something of the kind: for if the point objected to be withdrawn, he will be forced to admit the proposition because he cannot foresee in the rest of it any case where it does not hold true: if he refuse to admit it, then when asked for an objection he certainly will be unable to render one. Propositions that are partly false and partly true are of this type: for in the case of these it is possible by withdrawing a part to leave the rest true. If, however, you formulate the proposition on the strength of many cases and he has no objection to bring, you may claim that he shall admit it: for a premiss is valid in dialectics which thus holds in several instances and to which no objection is forthcoming.

Whenever it is possible to reason to the same conclusion either through or without a reduction per impossibile, if one is demonstrating and not arguing dialectically it makes no difference which method of reasoning be adopted, but in argument with another reasoning per impossibile should be avoided. For where one has reasoned without the reduction per impossibile, no dispute can arise; if, on the other hand, one does reason to an impossible conclusion, unless its falsehood is too plainly manifest, people deny that it is impossible, so that the questioners do not get what they want.

One should put forward all propositions that hold true of several cases, and to which either no objection whatever appears or at least not any on the surface: for when people cannot see any case in which it is not so, they admit it for true.

The conclusion should not be put in the form of a question; if it be, and the man shakes his head, it looks as if the reasoning had failed. For often, even if it be not put as a question but

advanced as a consequence, people deny it, and then those who do not see that it follows upon the previous admissions do not realize that those who deny it have been refuted: when, then, the one man merely asks it as a question without even saying that it so follows, and the other denies it, it looks altogether as if the reasoning had failed.

Not every universal question can form a dialectical proposition as ordinarily understood, e.g. 'What is man?' or 'How many meanings has «the good»?' For a dialectical premiss must be of a form to which it is possible to reply 'Yes' or 'No', whereas to the aforesaid it is not possible. For this reason questions of this kind are not dialectical unless the questioner himself draws distinctions or divisions before expressing them, e.g. 'Good means this, or this, does it not?' For questions of this sort are easily answered by a Yes or a No. Hence one should endeavour to formulate propositions of this kind in this form. It is at the same time also perhaps fair to ask the other man how many meanings of 'the good' there are, whenever you have yourself distinguished and formulated them, and he will not admit them at all.

Any one who keeps on asking one thing for a long time is a bad inquirer. For if he does so though the person questioned keeps on answering the questions, clearly he asks a large number of questions, or else asks the same question a large number of times: in the one case he merely babbles, in the other he fails to reason: for reasoning always consists of a small number of premisses. If, on the other hand, he does it because the person questioned does not answer the questions, he is at fault in not taking him to task or breaking off the discussion.

3

There are certain hypotheses upon which it is at once difficult to bring, and easy to stand up to, an argument. Such (e.g.) are those things which stand first and those which stand last in the order of nature. For the former require definition, while the latter have to be arrived at through many steps if one wishes to secure a continuous proof from first principles, or else all discussion about them wears the air of mere sophistry: for to prove anything is impossible unless one begins with the appropriate principles, and connects inference with inference till the last are reached. Now to define first principles is just what answerers do not care to do, nor do they pay any attention if the questioner makes a definition: and yet until it is clear what it is that is proposed, it is not easy to discuss it. This sort of thing happens particularly in the case of the first principles: for while the other propositions are shown through these, these cannot be shown through anything else: we are obliged to understand every item of that sort by a definition. The inferences, too, that lie too close to the first principle are hard to treat in argument: for it is not possible to bring many arguments in regard to them, because of the small number of those steps, between the conclusion and the principle, whereby the succeeding propositions have to be shown. The hardest, however, of all definitions to treat in argument are those that employ terms about which, in the first place, it is uncertain whether they are used in one sense or several, and, further, whether they are used literally or metaphorically by the definer. For because of their obscurity, it is impossible to argue upon such terms; and because of the impossibility of saying whether this obscurity is due to their being used metaphorically, it is impossible to refute them.

In general, it is safe to suppose that, whenever any problem proves intractable, it either needs definition or else bears either

several senses, or a metaphorical sense, or it is not far removed from the first principles; or else the reason is that we have yet to discover in the first place just this – in which of the aforesaid directions the source of our difficulty lies: when we have made this clear, then obviously our business must be either to define or to distinguish, or to supply the intermediate premisses: for it is through these that the final conclusions are shown.

It often happens that a difficulty is found in discussing or arguing a given position because the definition has not been correctly rendered: e.g. 'Has one thing one contrary or many?': here when the term 'contraries' has been properly defined, it is easy to bring people to see whether it is possible for the same thing to have several contraries or not: in the same way also with other terms requiring definition. It appears also in mathematics that the difficulty in using a figure is sometimes due to a defect in definition; e.g. in proving that the line which cuts the plane parallel to one side divides similarly both the line which it cuts and the area; whereas if the definition be given, the fact asserted becomes immediately clear: for the areas have the same fraction subtracted from them as have the sides: and this is the definition of 'the same ratio'. The most primary of the elementary principles are without exception very easy to show, if the definitions involved, e.g. the nature of a line or of a circle, be laid down; only the arguments that can be brought in regard to each of them are not many, because there are not many intermediate steps. If, on the other hand, the definition of the starting-points be not laid down, to show them is difficult and may even prove quite impossible. The case of the significance of verbal expressions is like that of these mathematical conceptions.

One may be sure then, whenever a position is hard to discuss, that one or other of the aforesaid things has happened to it. Whenever, on the other hand, it is a harder task to argue to the

point claimed, i.e. the premiss, than to the resulting position, a doubt may arise whether such claims should be admitted or not: for if a man is going to refuse to admit it and claim that you shall argue to it as well, he will be giving the signal for a harder undertaking than was originally proposed: if, on the other hand, he grants it, he will be giving the original thesis credence on the strength of what is less credible than itself. If, then, it is essential not to enhance the difficulty of the problem, he had better grant it; if, on the other hand, it be essential to reason through premisses that are better assured, he had better refuse. In other words, in serious inquiry he ought not to grant it, unless he be more sure about it than about the conclusion; whereas in a dialectical exercise he may do so if he is merely satisfied of its truth. Clearly, then, the circumstances under which such admissions should be claimed are different for a mere questioner and for a serious teacher.

4

As to the formulation, then, and arrangement of one's questions, about enough has been said.

With regard to the giving of answers, we must first define what is the business of a good answerer, as of a good questioner. The business of the questioner is so to develop the argument as to make the answerer utter the most extrvagant paradoxes that necessarily follow because of his position: while that of the answerer is to make it appear that it is not he who is responsible for the absurdity or paradox, but only his position: for one may, perhaps, distinguish between the mistake of taking up a wrong position to start with, and that of not maintaining it properly, when once taken up.

5

Inasmuch as no rules are laid down for those who argue for the sake of training and of examination: – and the aim of those engaged in teaching or learning is quite different from that of those engaged in a competition; as is the latter from that of those who discuss things together in the spirit of inquiry: for a learner should always state what he thinks: for no one is even trying to teach him what is false; whereas in a competition the business of the questioner is to appear by all means to produce an effect upon the other, while that of the answerer is to appear unaffected by him; on the other hand, in an assembly of disputants discussing in the spirit not of a competition but of an examination and inquiry, there are as yet no articulate rules about what the answerer should aim at, and what kind of things he should and should not grant for the correct or incorrect defence of his position: – inasmuch, then, as we have no tradition bequeathed to us by others, let us try to say something upon the matter for ourselves.

The thesis laid down by the answerer before facing the questioner's argument is bound of necessity to be one that is either generally accepted or generally rejected or else is neither: and moreover is so accepted or rejected either absolutely or else with a restriction, e.g. by some given person, by the speaker or by some one else. The manner, however, of its acceptance or rejection, whatever it be, makes no difference: for the right way to answer, i.e. to admit or to refuse to admit what has been asked, will be the same in either case. If, then, the statement laid down by the answerer be generally rejected, the conclusion aimed at by the questioner is bound to be one generally accepted, whereas if the former be generally accepted, the latter

is generally rejected: for the conclusion which the questioner tries to draw is always the opposite of the statement laid down. If, on the other hand, what is laid down is generally neither rejected nor accepted, the conclusion will be of the same type as well. Now since a man who reasons correctly demonstrates his proposed conclusion from premisses that are more generally accepted, and more familiar, it is clear that (1) where the view laid down by him is one that generally is absolutely rejected, the answerer ought not to grant either what is thus absolutely not accepted at all, or what is accepted indeed, but accepted less generally than the questioner's conclusion. For if the statement laid down by the answerer be generally rejected, the conclusion aimed at by the questioner will be one that is generally accepted, so that the premisses secured by the questioner should all be views generally accepted, and more generally accepted than his proposed conclusion, if the less familiar is to be inferred through the more familiar. Consequently, if any of the questions put to him be not of this character, the answerer should not grant them. (2) If, on the other hand, the statement laid down by the answerer be generally accepted without qualification, clearly the conclusion sought by the questioner will be one generally rejected without qualification. Accordingly, the answerer should admit all views that are generally accepted and, of those that are not generally accepted, all that are less generally rejected than the conclusion sought by the questioner. For then he will probably be thought to have argued sufficiently well. (3) Likewise, too, if the statement laid down by the answerer be neither rejected generally nor generally accepted; for then, too, anything that appears to be true should be granted, and, of the views not generally accepted, any that are more generally accepted than the questioner's conclusion; for in that case the result will be that the arguments will be more generally accepted. If, then, the view laid down by the answerer be one that is generally

accepted or rejected without qualification, then the views that are accepted absolutely must be taken as the standard of comparison: whereas if the view laid down be one that is not generally accepted or rejected, but only by the answerer, then the standard whereby the latter must judge what is generally accepted or not, and must grant or refuse to grant the point asked, is himself. If, again, the answerer be defending some one else's opinion, then clearly it will be the latter's judgement to which he must have regard in granting or denying the various points. This is why those, too, who introduce other's opinions, e.g. that 'good and evil are the same thing, as Heraclitus says,' refuse to admit the impossibility of contraries belonging at the same time to the same thing; not because they do not themselves believe this, but because on Heraclitus' principles one has to say so. The same thing is done also by those who take on the defence of one another's positions; their aim being to speak as would the man who stated the position.

6

It is clear, then, what the aims of the answerer should be, whether the position he lays down be a view generally accepted without qualification or accepted by some definite person. Now every question asked is bound to involve some view that is either generally held or generally rejected or neither, and is also bound to be either relevant to the argument or irrelevant: if then it be a view generally accepted and irrelevant, the answerer should grant it and remark that it is the accepted view: if it be a view not generally accepted and irrelevant, he should grant it but add a comment that it is not generally accepted, in order to avoid the appearance of being a simpleton. If it be relevant and also be generally accepted, he should admit

that it is the view generally accepted but say that it lies too close to the original proposition, and that if it be granted the problem proposed collapses. If what is claimed by the questioner be relevant but too generally rejected, the answerer, while admitting that if it be granted the conclusion sought follows, should yet protest that the proposition is too absurd to be admitted. Suppose, again, it be a view that is neither rejected generally nor generally accepted, then, if it be irrelevant to the argument, it may be granted without restriction; if, however, it be relevant, the answerer should add the comment that, if it be granted, the original problem collapses. For then the answerer will not be held to be personally accountable for what happens to him, if he grants the several points with his eyes open, and also the questioner will be able to draw his inference, seeing that all the premisses that are more generally accepted than the conclusion are granted him. Those who try to draw an inference from premisses more generally rejected than the conclusion clearly do not reason correctly: hence, when men ask these things, they ought not to be granted.

7

The questioner should be met in a like manner also in the case of terms used obscurely, i.e. in several senses. For the answerer, if he does not understand, is always permitted to say 'I do not understand': he is not compelled to reply 'Yes' or 'No' to a question which may mean different things. Clearly, then, in the first place, if what is said be not clear, he ought not to hesitate to say that he does not understand it; for often people encounter some difficulty from assenting to questions that are not clearly put. If he understands the question and yet it covers many senses, then supposing what it says to be universally true

or false, he should give it an unqualified assent or denial: if, on the other hand, it be partly true and partly false, he should add a comment that it bears different senses, and also that in one it is true, in the other false: for if he leave this distinction till later, it becomes uncertain whether originally as well he perceived the ambiguity or not. If he does not foresee the ambiguity, but assents to the question having in view the one sense of the words, then, if the questioner takes it in the other sense, he should say, 'That was not what I had in view when I admitted it; I meant the other sense': for if a term or expression covers more than one thing, it is easy to disagree. If, however, the question is both clear and simple, he should answer either 'Yes' or 'No'.

8

A premiss in reasoning always either is one of the constituent elements in the reasoning, or else goes to establish one of these: (and you can always tell when it is secured in order to establish something else by the fact of a number of similar questions being put: for as a rule people secure their universal by means either of induction or of likeness): – accordingly the particular propositions should all be admitted, if they are true and generally held. On the other hand, against the universal one should try to bring some negative instance; for to bring the argument to a standstill without a negative instance, either real or apparent, shows ill-temper. If, then, a man refuses to grant the universal when supported by many instances, although he has no negative instance to show, he obviously shows ill-temper. If, moreover, he cannot even attempt a counter-proof that it is not true, far more likely is he to be thought ill-tempered – although even counter-proof is not enough: for we often hear arguments that are contrary to common opinions,

whose solution is yet difficult, e.g. the argument of Zeno that it is impossible to move or to traverse the stadium; – but still, this is no reason for omitting to assert the opposites of these views. If, then, a man refuses to admit the proposition without having either a negative instance or some counter-argument to bring against it, clearly he is ill-tempered: for ill-temper in argument consists in answering in ways other than the above, so as to wreck the reasoning.

9

Before maintaining either a thesis or a definition the answerer should try his hand at attacking it by himself; for clearly his business is to oppose those positions from which questioners demolish what he has laid down.

He should beware of maintaining a hypothesis that is generally rejected: and this it may be in two ways: for it may be one which results in absurd statements, e.g. suppose any one were to say that everything is in motion or that nothing is; and also there are all those which only a bad character would choose, and which are implicitly opposed to men's wishes, e.g. that pleasure is the good, and that to do injustice is better than to suffer it. For people then hate him, supposing him to maintain them not for the sake of argument but because he really thinks them.

10

Of all arguments that reason to a false conclusion the right solution is to demolish the point on which the fallacy that occurs depends: for the demolition of any random point is no solution, even though the point demolished be false. For the

argument may contain many falsehoods, e.g. suppose some one to secure the premisses, ‘He who sits, writes’ and ‘Socrates is sitting’: for from these it follows that ‘Socrates is writing’. Now we may demolish the proposition ‘Socrates is sitting’, and still be no nearer a solution of the argument; it may be true that the point claimed is false; but it is not on that that fallacy of the argument depends: for supposing that any one should happen to be sitting and not writing, it would be impossible in such a case to apply the same solution. Accordingly, it is not this that needs to be demolished, but rather that ‘He who sits, writes’: for he who sits does not always write. He, then, who has demolished the point on which the fallacy depends, has given the solution of the argument completely. Any one who knows that it is on such and such a point that the argument depends, knows the solution of it, just as in the case of a figure falsely drawn. For it is not enough to object, even if the point demolished be a falsehood, but the reason of the fallacy should also be proved: for then it would be clear whether the man makes his objection with his eyes open or not.

There are four possible ways of preventing a man from working his argument to a conclusion. It can be done either by demolishing the point on which the falsehood that comes about depends, or by stating an objection directed against the questioner: for often when a solution has not as a matter of fact been brought, yet the questioner is rendered thereby unable to pursue the argument any farther. Thirdly, one may object to the questions asked: for it may happen that what the questioner wants does not follow from the questions he has asked because he has asked them badly, whereas if something additional be granted the conclusion comes about. If, then, the questioner be unable to pursue his argument farther, the objection would properly be directed against the questioner; if he can do so, then it would be against his questions. The fourth and worst kind of objection is that which is directed to the time allowed for

discussion: for some people bring objections of a kind which would take longer to answer than the length of the discussion in hand.

There are then, as we said, four ways of making objections: but of them the first alone is a solution: the others are just hindrances and stumbling-blocks to prevent the conclusions.

11

Adverse criticism of an argument on its own merits, and of it when presented in the form of questions, are two different things. For often the failure to carry through the argument correctly in discussion is due to the person questioned, because he will not grant the steps of which a correct argument might have been made against his position: for it is not in the power of the one side only to effect properly a result that depends on both alike. Accordingly it sometimes becomes necessary to attack the speaker and not his position, when the answerer lies in wait for the points that are contrary to the questioner and becomes abusive as well: when people lose their tempers in this way, their argument becomes a contest, not a discussion. Moreover, since arguments of this kind are held not for the sake of instruction but for purposes of practice and examination, clearly one has to reason not only to true conclusions, but also to false ones, and not always through true premisses, but sometimes through false as well. For often, when a true proposition is put forward, the dialectician is compelled to demolish it: and then false propositions have to be formulated. Sometimes also when a false proposition is put forward, it has to be demolished by means of false propositions: for it is possible for a given man to believe what is not the fact more

firmly than the truth. Accordingly, if the argument be made to depend on something that he holds, it will be easier to persuade or help him. He, however, who would rightly convert any one to a different opinion should do so in a dialectical and not in a contentious manner, just as a geometrician should reason geometrically, whether his conclusion be false or true: what kind of syllogisms are dialectical has already been said. The principle that a man who hinders the common business is a bad partner, clearly applies to an argument as well; for in arguments as well there is a common aim in view, except with mere contestants, for these cannot both reach the same goal; for more than one cannot possibly win. It makes no difference whether he effects this as answerer or as questioner: for both he who asks contentious questions is a bad dialectician, and also he who in answering fails to grant the obvious answer or to understand the point of the questioner's inquiry. What has been said, then, makes it clear that adverse criticism is not to be passed in a like strain upon the argument on its own merits, and upon the questioner: for it may very well be that the argument is bad, but that the questioner has argued with the answerer in the best possible way: for when men lose their tempers, it may perhaps be impossible to make one's inferences straight-forwardly as one would wish: we have to do as we can.

Inasmuch as it is indeterminate when people are claiming the admission of contrary things, and when they are claiming what originally they set out to prove – for often when they are talking by themselves they say contrary things, and admit afterwards what they have previously denied; for which reason they often assent, when questioned, to contrary things and to what originally had to be proved – the argument is sure to become vitiated. The responsibility, however, for this rests with the answerer, because while refusing to grant other points, he does grant points of that kind. It is, then, clear that adverse criticism

is not to be passed in a like manner upon questioners and upon their arguments.

In itself an argument is liable to five kinds of adverse criticism:

(1) The first is when neither the proposed conclusion nor indeed any conclusion at all is drawn from the questions asked, and when most, if not all, of the premisses on which the conclusion rests are false or generally rejected, when, moreover, neither any withdrawals nor additions nor both together can bring the conclusions about.

(2) The second is, supposing the reasoning, though constructed from the premisses, and in the manner, described above, were to be irrelevant to the original position.

(3) The third is, supposing certain additions would bring an inference about but yet these additions were to be weaker than those that were put as questions and less generally held than the conclusion.

(4) Again, supposing certain withdrawals could effect the same: for sometimes people secure more premisses than are necessary, so that it is not through them that the inference comes about.

(5) Moreover, suppose the premisses be less generally held and less credible than the conclusion, or if, though true, they require more trouble to prove than the proposed view.

One must not claim that the reasoning to a proposed view shall in every case equally be a view generally accepted and convincing: for it is a direct result of the nature of things that some subjects of inquiry shall be easier and some harder, so that if a man brings people to accept his point from opinions that are as generally received as the case admits, he has argued his case correctly. Clearly, then, not even the argument itself is

open to the same adverse criticism when taken in relation to the proposed conclusion and when taken by itself. For there is nothing to prevent the argument being open to reproach in itself, and yet commendable in relation to the proposed conclusion, or again, vice versa, being commendable in itself, and yet open to reproach in relation to the proposed conclusion, whenever there are many propositions both generally held and also true whereby it could easily be proved. It is possible also that an argument, even though brought to a conclusion, may sometimes be worse than one which is not so concluded, whenever the premisses of the former are silly, while its conclusion is not so; whereas the latter, though requiring certain additions, requires only such as are generally held and true, and moreover does not rest as an argument on these additions. With those which bring about a true conclusion by means of false premisses, it is not fair to find fault: for a false conclusion must of necessity always be reached from a false premiss, but a true conclusion may sometimes be drawn even from false premisses; as is clear from the Analytics.

Whenever by the argument stated something is demonstrated, but that something is other than what is wanted and has no bearing whatever on the conclusion, then no inference as to the latter can be drawn from it: and if there appears to be, it will be a sophism, not a proof. A philosopheme is a demonstrative inference: an epichireme is a dialectical inference: a sophism is a contentious inference: an aporeme is an inference that reasons dialectically to a contradiction.

If something were to be shown from premisses, both of which are views generally accepted, but not accepted with like conviction, it may very well be that the conclusion shown is something held more strongly than either. If, on the other hand, general opinion be for the one and neither for nor against the other, or if it be for the one and against the other, then, if the

pro and con be alike in the case of the premisses, they will be alike for the conclusion also: if, on the other hand, the one preponderates, the conclusion too will follow suit.

It is also a fault in reasoning when a man shows something through a long chain of steps, when he might employ fewer steps and those already included in his argument: suppose him to be showing (e.g.) that one opinion is more properly so called than another, and suppose him to make his postulates as follows: 'x-in-itself is more fully x than anything else': 'there genuinely exists an object of opinion in itself': therefore 'the object-of-opinion-in-itself is more fully an object of opinion than the particular objects of opinion'. Now 'a relative term is more fully itself when its correlate is more fully itself': and 'there exists a genuine opinion-in-itself, which will be «opinion» in a more accurate sense than the particular opinions': and it has been postulated both that 'a genuine opinion-in-itself exists', and that 'x-in-itself is more fully x than anything else': therefore 'this will be opinion in a more accurate sense'. Wherein lies the viciousness of the reasoning? Simply in that it conceals the ground on which the argument depends.

12

An argument is clear in one, and that the most ordinary, sense, if it be so brought to a conclusion as to make no further questions necessary: in another sense, and this is the type most usually advanced, when the propositions secured are such as compel the conclusion, and the argument is concluded through premisses that are themselves conclusions: moreover, it is so also if some step is omitted that generally is firmly accepted.

An argument is called fallacious in four senses: (1) when it appears to be brought to a conclusion, and is not really so – what is called 'contentious' reasoning: (2) when it comes to a conclusion but not to the conclusion proposed – which happens principally in the case of reductiones ad impossibile: (3) when it comes to the proposed conclusion but not according to the mode of inquiry appropriate to the case, as happens when a non-medical argument is taken to be a medical one, or one which is not geometrical for a geometrical argument, or one which is not dialectical for dialectical, whether the result reached be true or false: (4) if the conclusion be reached through false premisses: of this type the conclusion is sometimes false, sometimes true: for while a false conclusion is always the result of false premisses, a true conclusion may be drawn even from premisses that are not true, as was said above as well.

Fallacy in argument is due to a mistake of the arguer rather than of the argument: yet it is not always the fault of the arguer either, but only when he is not aware of it: for we often accept on its merits in preference to many true ones an argument which demolishes some true proposition if it does so from premisses as far as possible generally accepted. For an argument of that kind does demonstrate other things that are true: for one of the premisses laid down ought never to be there at all, and this will then be demonstrated. If, however, a true conclusion were to be reached through premisses that are false and utterly childish, the argument is worse than many arguments that lead to a false conclusion, though an argument which leads to a false conclusion may also be of this type. Clearly then the first thing to ask in regard to the argument in itself is, 'Has it a conclusion?'; the second, 'Is the conclusion true or false?'; the third, 'Of what kind of premisses does it consist?': for if the latter, though false, be generally accepted, the argument is dialectical, whereas if, though true, they be generally rejected, it is bad: if they be both false and also

entirely contrary to general opinion, clearly it is bad, either altogether or else in relation to the particular matter in hand.

13

Of the ways in which a questioner may beg the original question and also beg contraries the true account has been given in the Analytics:' but an account on the level of general opinion must be given now.

People appear to beg their original question in five ways: the first and most obvious being if any one begs the actual point requiring to be shown: this is easily detected when put in so many words; but it is more apt to escape detection in the case of different terms, or a term and an expression, that mean the same thing. A second way occurs whenever any one begs universally something which he has to demonstrate in a particular case: suppose (e.g.) he were trying to prove that the knowledge of contraries is one and were to claim that the knowledge of opposites in general is one: for then he is generally thought to be begging, along with a number of other things, that which he ought to have shown by itself. A third way is if any one were to beg in particular cases what he undertakes to show universally: e.g. if he undertook to show that the knowledge of contraries is always one, and begged it of certain pairs of contraries: for he also is generally considered to be begging independently and by itself what, together with a number of other things, he ought to have shown. Again, a man begs the question if he begs his conclusion piecemeal: supposing e.g. that he had to show that medicine is a science of what leads to health and to disease, and were to claim first the one, then the other; or, fifthly, if he were to beg the one or the

other of a pair of statements that necessarily involve one other; e.g. if he had to show that the diagonal is incommensurable with the side, and were to beg that the side is incommensurable with the diagonal.

The ways in which people assume contraries are equal in number to those in which they beg their original question. For it would happen, firstly, if any one were to beg an opposite affirmation and negation; secondly, if he were to beg the contrary terms of an antithesis, e.g. that the same thing is good and evil; thirdly, suppose any one were to claim something universally and then proceed to beg its contradictory in some particular case, e.g. if having secured that the knowledge of contraries is one, he were to claim that the knowledge of what makes for health or for disease is different; or, fourthly, suppose him, after postulating the latter view, to try to secure universally the contradictory statement. Again, fifthly, suppose a man begs the contrary of the conclusion which necessarily comes about through the premisses laid down; and this would happen suppose, even without begging the opposites in so many words, he were to beg two premisses such that this contradictory statement that is opposite to the first conclusion will follow from them. The securing of contraries differs from begging the original question in this way: in the latter case the mistake lies in regard to the conclusion; for it is by a glance at the conclusion that we tell that the original question has been begged: whereas contrary views lie in the premisses, viz. in a certain relation which they bear to one another.

14

The best way to secure training and practice in arguments of this kind is in the first place to get into the habit of converting the arguments. For in this way we shall be better equipped for dealing with the proposition stated, and after a few attempts we shall know several arguments by heart. For by 'conversion' of an argument is meant the taking the reverse of the conclusion together with the remaining propositions asked and so demolishing one of those that were conceded: for it follows necessarily that if the conclusion be untrue, some one of the premisses is demolished, seeing that, given all the premisses, the conclusion was bound to follow. Always, in dealing with any proposition, be on the look-out for a line of argument both pro and con: and on discovering it at once set about looking for the solution of it: for in this way you will soon find that you have trained yourself at the same time in both asking questions and answering them. If we cannot find any one else to argue with, we should argue with ourselves. Select, moreover, arguments relating to the same thesis and range them side by side: for this produces a plentiful supply of arguments for carrying a point by sheer force, and in refutation also it is of great service, whenever one is well stocked with arguments pro and con: for then you find yourself on your guard against contrary statements to the one you wish to secure. Moreover, as contributing to knowledge and to philosophic wisdom the power of discerning and holding in one view the results of either of two hypotheses is no mean instrument; for it then only remains to make a right choice of one of them. For a task of this kind a certain natural ability is required: in fact real natural ability just is the power right to choose the true and shun the false. Men of natural ability can do this; for by a right liking or disliking for whatever is proposed to them they rightly select what is best.

It is best to know by heart arguments upon those questions which are of most frequent occurrence, and particularly in regard to those propositions which are ultimate: for in discussing these answerers frequently give up in despair. Moreover, get a good stock of definitions: and have those of familiar and primary ideas at your fingers' ends: for it is through these that reasonings are effected. You should try, moreover, to master the heads under which other arguments mostly tend to fall. For just as in geometry it is useful to be practised in the elements, and in arithmetic to have the multiplication table up to ten at one's fingers' ends – and indeed it makes a great difference in one's knowledge of the multiples of other numbers too – likewise also in arguments it is a great advantage to be well up in regard to first principles, and to have a thorough knowledge of premisses at the tip of one's tongue. For just as in a person with a trained memory, a memory of things themselves is immediately caused by the mere mention of their loci, so these habits too will make a man readier in reasoning, because he has his premisses classified before his mind's eye, each under its number. It is better to commit to memory a premiss of general application than an argument: for it is difficult to be even moderately ready with a first principle, or hypothesis.

Moreover, you should get into the habit of turning one argument into several, and conceal your procedure as darkly as you can: this kind of effect is best produced by keeping as far as possible away from topics akin to the subject of the argument. This can be done with arguments that are entirely universal, e.g. the statement that 'there cannot be one knowledge of more than one thing': for that is the case with both relative terms and contraries and co-ordinates.

Records of discussions should be made in a universal form, even though one has argued only some particular case: for this

will enable one to turn a single rule into several. A like rule applies in Rhetoric as well to enthymemes. For yourself, however, you should as far as possible avoid universalizing your reasonings. You should, moreover, always examine arguments to see whether they rest on principles of general application: for all particular arguments really reason universally, as well, i.e. a particular demonstration always contains a universal demonstration, because it is impossible to reason at all without using universals.

You should display your training in inductive reasoning against a young man, in deductive against an expert. You should try, moreover, to secure from those skilled in deduction their premisses, from inductive reasoners their parallel cases; for this is the thing in which they are respectively trained. In general, too, from your exercises in argumentation you should try to carry away either a syllogism on some subject or a refutation or a proposition or an objection, or whether some one put his question properly or improperly (whether it was yourself or some one else) and the point which made it the one or the other. For this is what gives one ability, and the whole object of training is to acquire ability, especially in regard to propositions and objections. For it is the skilled propounder and objector who is, speaking generally, a dialectician. To formulate a proposition is to form a number of things into one – for the conclusion to which the argument leads must be taken generally, as a single thing – whereas to formulate an objection is to make one thing into many; for the objector either distinguishes or demolishes, partly granting, partly denying the statements proposed.

Do not argue with every one, nor practise upon the man in the street: for there are some people with whom any argument is bound to degenerate. For against any one who is ready to try all means in order to seem not to be beaten, it is indeed fair to try

all means of bringing about one's conclusion: but it is not good form. Wherefore the best rule is, not lightly to engage with casual acquaintances, or bad argument is sure to result. For you see how in practising together people cannot refrain from contentious argument.

It is best also to have ready-made arguments relating to those questions in which a very small stock will furnish us with arguments serviceable on a very large number of occasions. These are those that are universal, and those in regard to which it is rather difficult to produce points for ourselves from matters of everyday experience.

Aristotle - On Sophistical Refutations

[Translated by W. A. Pickard-Cambridge]

1

Let us now discuss sophistic refutations, i.e. what appear to be refutations but are really fallacies instead. We will begin in the natural order with the first.

That some reasonings are genuine, while others seem to be so but are not, is evident. This happens with arguments, as also elsewhere, through a certain likeness between the genuine and the sham. For physically some people are in a vigorous condition, while others merely seem to be so by blowing and rigging themselves out as the tribesmen do their victims for sacrifice; and some people are beautiful thanks to their beauty, while others seem to be so, by dint of embellishing themselves. So it is, too, with inanimate things; for of these, too, some are really silver and others gold, while others are not and merely seem to be such to our sense; e.g. things made of litharge and tin seem to be of silver, while those made of yellow metal look golden. In the same way both reasoning and refutation are sometimes genuine, sometimes not, though inexperience may make them appear so: for inexperienced people obtain only, as it were, a distant view of these things. For reasoning rests on certain statements such that they involve necessarily the assertion of something other than what has been stated, through what has been stated: refutation is reasoning involving the contradictory of the given conclusion. Now some of them do not really achieve this, though they seem to do so for a number of reasons; and of these the most prolific and usual domain is

the argument that turns upon names only. It is impossible in a discussion to bring in the actual things discussed: we use their names as symbols instead of them; and therefore we suppose that what follows in the names, follows in the things as well, just as people who calculate suppose in regard to their counters. But the two cases (names and things) are not alike. For names are finite and so is the sum-total of formulae, while things are infinite in number. Inevitably, then, the same formulae, and a single name, have a number of meanings. Accordingly just as, in counting, those who are not clever in manipulating their counters are taken in by the experts, in the same way in arguments too those who are not well acquainted with the force of names misreason both in their own discussions and when they listen to others. For this reason, then, and for others to be mentioned later, there exists both reasoning and refutation that is apparent but not real. Now for some people it is better worth while to seem to be wise, than to be wise without seeming to be (for the art of the sophist is the semblance of wisdom without the reality, and the sophist is one who makes money from an apparent but unreal wisdom); for them, then, it is clearly essential also to seem to accomplish the task of a wise man rather than to accomplish it without seeming to do so. To reduce it to a single point of contrast it is the business of one who knows a thing, himself to avoid fallacies in the subjects which he knows and to be able to show up the man who makes them; and of these accomplishments the one depends on the faculty to render an answer, and the other upon the securing of one. Those, then, who would be sophists are bound to study the class of arguments aforesaid: for it is worth their while: for a faculty of this kind will make a man seem to be wise, and this is the purpose they happen to have in view.

Clearly, then, there exists a class of arguments of this kind, and it is at this kind of ability that those aim whom we call sophists. Let us now go on to discuss how many kinds there are of

sophistical arguments, and how many in number are the elements of which this faculty is composed, and how many branches there happen to be of this inquiry, and the other factors that contribute to this art.

2

Of arguments in dialogue form there are four classes:

Didactic, Dialectical, Examination-arguments, and Contentious arguments. Didactic arguments are those that reason from the principles appropriate to each subject and not from the opinions held by the answerer (for the learner should take things on trust): dialectical arguments are those that reason from premisses generally accepted, to the contradictory of a given thesis: examination-arguments are those that reason from premisses which are accepted by the answerer and which any one who pretends to possess knowledge of the subject is bound to know-in what manner, has been defined in another treatise: contentious arguments are those that reason or appear to reason to a conclusion from premisses that appear to be generally accepted but are not so. The subject, then, of demonstrative arguments has been discussed in the Analytics, while that of dialectic arguments and examination-arguments has been discussed elsewhere: let us now proceed to speak of the arguments used in competitions and contests.

3

First we must grasp the number of aims entertained by those who argue as competitors and rivals to the death. These are five in number, refutation, fallacy, paradox, solecism, and fifthly to reduce the opponent in the discussion to babbling – i.e. to constrain him to repeat himself a number of times: or it is to produce the appearance of each of these things without the reality. For they choose if possible plainly to refute the other party, or as the second best to show that he is committing some fallacy, or as a third best to lead him into paradox, or fourthly to reduce him to solecism, i.e. to make the answerer, in consequence of the argument, to use an ungrammatical expression; or, as a last resort, to make him repeat himself.

4

There are two styles of refutation: for some depend on the language used, while some are independent of language. Those ways of producing the false appearance of an argument which depend on language are six in number: they are ambiguity, amphiboly, combination, division of words, accent, form of expression. Of this we may assure ourselves both by induction, and by syllogistic proof based on this – and it may be on other assumptions as well – that this is the number of ways in which we might fall to mean the same thing by the same names or expressions. Arguments such as the following depend upon ambiguity. 'Those learn who know: for it is those who know their letters who learn the letters dictated to them'. For to 'learn' is ambiguous; it signifies both 'to understand' by the use of knowledge, and also 'to acquire knowledge'. Again, 'Evils are good: for what needs to be is good, and evils must needs be'. For

‘what needs to be’ has a double meaning: it means what is inevitable, as often is the case with evils, too (for evil of some kind is inevitable), while on the other hand we say of good things as well that they ‘need to be’. Moreover, ‘The same man is both seated and standing and he is both sick and in health: for it is he who stood up who is standing, and he who is recovering who is in health: but it is the seated man who stood up, and the sick man who was recovering’. For ‘The sick man does so and so’, or ‘has so and so done to him’ is not single in meaning: sometimes it means ‘the man who is sick or is seated now’, sometimes ‘the man who was sick formerly’. Of course, the man who was recovering was the sick man, who really was sick at the time: but the man who is in health is not sick at the same time: he is ‘the sick man’ in the sense not that he is sick now, but that he was sick formerly. Examples such as the following depend upon amphiboly: ‘I wish that you the enemy may capture’. Also the thesis, ‘There must be knowledge of what one knows’: for it is possible by this phrase to mean that knowledge belongs to both the knower and the known. Also, ‘There must be sight of what one sees: one sees the pillar: ergo the pillar has sight’. Also, ‘What you profess to-be, that you profess to-be: you profess a stone to-be: ergo you profess-to-be a stone’. Also, ‘Speaking of the silent is possible’: for ‘speaking of the silent’ also has a double meaning: it may mean that the speaker is silent or that the things of which he speaks are so. There are three varieties of these ambiguities and amphibolies: (1) When either the expression or the name has strictly more than one meaning, e.g. aetos and the ‘dog’; (2) when by custom we use them so; (3) when words that have a simple sense taken alone have more than one meaning in combination; e.g. ‘knowing letters’. For each word, both ‘knowing’ and ‘letters’, possibly has a single meaning: but both together have more than one – either that the letters themselves have knowledge or that someone else has it of them.

Amphiboly and ambiguity, then, depend on these modes of speech. Upon the combination of words there depend instances such as the following: 'A man can walk while sitting, and can write while not writing'. For the meaning is not the same if one divides the words and if one combines them in saying that 'it is possible to walk-while-sitting' and write while not writing. The same applies to the latter phrase, too, if one combines the words 'to write-while-not-writing': for then it means that he has the power to write and not to write at once; whereas if one does not combine them, it means that when he is not writing he has the power to write. Also, 'He now if he has learnt his letters'. Moreover, there is the saying that 'One single thing if you can carry a crowd you can carry too'.

Upon division depend the propositions that 5 is 2 and 3, and odd, and that the greater is equal: for it is that amount and more besides. For the same phrase would not be thought always to have the same meaning when divided and when combined, e.g. 'I made thee a slave once a free man', and 'God-like Achilles left fifty a hundred men'.

An argument depending upon accent it is not easy to construct in unwritten discussion; in written discussions and in poetry it is easier. Thus (e.g.) some people emend Homer against those who criticize as unnatural his expression to men ou kataputhetai ombro. For they solve the difficulty by a change of accent, pronouncing the ou with an acuter accent. Also, in the passage about Agamemnon's dream, they say that Zeus did not himself say 'We grant him the fulfilment of his prayer', but that he bade the dream grant it. Instances such as these, then, turn upon the accentuation.

Others come about owing to the form of expression used, when what is really different is expressed in the same form, e.g. a masculine thing by a feminine termination, or a feminine thing

by a masculine, or a neuter by either a masculine or a feminine; or, again, when a quality is expressed by a termination proper to quantity or vice versa, or what is active by a passive word, or a state by an active word, and so forth with the other divisions previously' laid down. For it is possible to use an expression to denote what does not belong to the class of actions at all as though it did so belong. Thus (e.g.) 'flourishing' is a word which in the form of its expression is like 'cutting' or 'building': yet the one denotes a certain quality – i.e. a certain condition – while the other denotes a certain action. In the same manner also in the other instances.

Refutations, then, that depend upon language are drawn from these common-place rules. Of fallacies, on the other hand, that are independent of language there are seven kinds:

(1) that which depends upon Accident:

(2) the use of an expression absolutely or not absolutely but with some qualification of respect or place, or time, or relation:

(3) that which depends upon ignorance of what 'refutation' is:

(4) that which depends upon the consequent:

(5) that which depends upon assuming the original conclusion:

(6) stating as cause what is not the cause:

(7) the making of more than one question into one.

5

Fallacies, then, that depend on Accident occur whenever any attribute is claimed to belong in like manner to a thing and to

its accident. For since the same thing has many accidents there is no necessity that all the same attributes should belong to all of a thing's predicates and to their subject as well. Thus (e.g.), 'If Coriscus be different from «man», he is different from himself: for he is a man': or 'If he be different from Socrates, and Socrates be a man, then', they say, 'he has admitted that Coriscus is different from a man, because it so happens (accidit) that the person from whom he said that he (Coriscus) is different is a man'.

Those that depend on whether an expression is used absolutely or in a certain respect and not strictly, occur whenever an expression used in a particular sense is taken as though it were used absolutely, e.g. in the argument 'If what is not is the object of an opinion, then what is not is': for it is not the same thing 'to be x' and 'to be' absolutely. Or again, 'What is, is not, if it is not a particular kind of being, e.g. if it is not a man.' For it is not the same thing 'not to be x' and 'not to be' at all: it looks as if it were, because of the closeness of the expression, i.e. because 'to be x' is but little different from 'to be', and 'not to be x' from 'not to be'. Likewise also with any argument that turns upon the point whether an expression is used in a certain respect or used absolutely. Thus e.g. 'Suppose an Indian to be black all over, but white in respect of his teeth; then he is both white and not white.' Or if both characters belong in a particular respect, then, they say, 'contrary attributes belong at the same time'. This kind of thing is in some cases easily seen by any one, e.g. suppose a man were to secure the statement that the Ethiopian is black, and were then to ask whether he is white in respect of his teeth; and then, if he be white in that respect, were to suppose at the conclusion of his questions that therefore he had proved dialectically that he was both white and not white. But in some cases it often passes undetected, viz. in all cases where, whenever a statement is made of something in a certain respect, it would be generally thought that the absolute

statement follows as well; and also in all cases where it is not easy to see which of the attributes ought to be rendered strictly. A situation of this kind arises, where both the opposite attributes belong alike: for then there is general support for the view that one must agree absolutely to the assertion of both, or of neither: e.g. if a thing is half white and half black, is it white or black?

Other fallacies occur because the terms ‘proof’ or ‘refutation’ have not been defined, and because something is left out in their definition. For to refute is to contradict one and the same attribute – not merely the name, but the reality – and a name that is not merely synonymous but the same name – and to confute it from the propositions granted, necessarily, without including in the reckoning the original point to be proved, in the same respect and relation and manner and time in which it was asserted. A ‘false assertion’ about anything has to be defined in the same way. Some people, however, omit some one of the said conditions and give a merely apparent refutation, showing (e.g.) that the same thing is both double and not double: for two is double of one, but not double of three. Or, it may be, they show that it is both double and not double of the same thing, but not that it is so in the same respect: for it is double in length but not double in breadth. Or, it may be, they show it to be both double and not double of the same thing and in the same respect and manner, but not that it is so at the same time: and therefore their refutation is merely apparent. One might, with some violence, bring this fallacy into the group of fallacies dependent on language as well.

Those that depend on the assumption of the original point to be proved, occur in the same way, and in as many ways, as it is possible to beg the original point; they appear to refute because men lack the power to keep their eyes at once upon what is the same and what is different.

The refutation which depends upon the consequent arises because people suppose that the relation of consequence is convertible. For whenever, suppose A is, B necessarily is, they then suppose also that if B is, A necessarily is. This is also the source of the deceptions that attend opinions based on sense-perception. For people often suppose bile to be honey because honey is attended by a yellow colour: also, since after rain the ground is wet in consequence, we suppose that if the ground is wet, it has been raining; whereas that does not necessarily follow. In rhetoric proofs from signs are based on consequences. For when rhetoricians wish to show that a man is an adulterer, they take hold of some consequence of an adulterous life, viz. that the man is smartly dressed, or that he is observed to wander about at night. There are, however, many people of whom these things are true, while the charge in question is untrue. It happens like this also in real reasoning; e.g. Melissus' argument, that the universe is eternal, assumes that the universe has not come to be (for from what is not nothing could possibly come to be) and that what has come to be has done so from a first beginning. If, therefore, the universe has not come to be, it has no first beginning, and is therefore eternal. But this does not necessarily follow: for even if what has come to be always has a first beginning, it does not also follow that what has a first beginning has come to be; any more than it follows that if a man in a fever be hot, a man who is hot must be in a fever.

The refutation which depends upon treating as cause what is not a cause, occurs whenever what is not a cause is inserted in the argument, as though the refutation depended upon it. This kind of thing happens in arguments that reason ad impossible: for in these we are bound to demolish one of the premisses. If, then, the false cause be reckoned in among the questions that are necessary to establish the resulting impossibility, it will often be thought that the refutation depends upon it, e.g. in the

proof that the 'soul' and 'life' are not the same: for if coming-to-be be contrary to perishing, then a particular form of perishing will have a particular form of coming-to-be as its contrary: now death is a particular form of perishing and is contrary to life: life, therefore, is a coming to-be, and to live is to come-to-be. But this is impossible: accordingly, the 'soul' and 'life' are not the same. Now this is not proved: for the impossibility results all the same, even if one does not say that life is the same as the soul, but merely says that life is contrary to death, which is a form of perishing, and that perishing has 'coming-to-be' as its contrary. Arguments of that kind, then, though not inconclusive absolutely, are inconclusive in relation to the proposed conclusion. Also even the questioners themselves often fail quite as much to see a point of that kind.

Such, then, are the arguments that depend upon the consequent and upon false cause. Those that depend upon the making of two questions into one occur whenever the plurality is undetected and a single answer is returned as if to a single question. Now, in some cases, it is easy to see that there is more than one, and that an answer is not to be given, e.g. 'Does the earth consist of sea, or the sky?' But in some cases it is less easy, and then people treat the question as one, and either confess their defeat by failing to answer the question, or are exposed to an apparent refutation. Thus 'Is A and is B a man?' 'Yes.' 'Then if any one hits A and B, he will strike a man' (singular),'not men' (plural). Or again, where part is good and part bad, 'is the whole good or bad?' For whichever he says, it is possible that he might be thought to expose himself to an apparent refutation or to make an apparently false statement: for to say that something is good which is not good, or not good which is good, is to make a false statement. Sometimes, however, additional premisses may actually give rise to a genuine refutation; e.g. suppose a man were to grant that the descriptions 'white' and 'naked' and 'blind' apply to one thing

and to a number of things in a like sense. For if 'blind' describes a thing that cannot see though nature designed it to see, it will also describe things that cannot see though nature designed them to do so. Whenever, then, one thing can see while another cannot, they will either both be able to see or else both be blind; which is impossible.

6

The right way, then, is either to divide apparent proofs and refutations as above, or else to refer them all to ignorance of what 'refutation' is, and make that our starting-point: for it is possible to analyse all the aforesaid modes of fallacy into breaches of the definition of a refutation. In the first place, we may see if they are inconclusive: for the conclusion ought to result from the premisses laid down, so as to compel us necessarily to state it and not merely to seem to compel us. Next we should also take the definition bit by bit, and try the fallacy thereby. For of the fallacies that consist in language, some depend upon a double meaning, e.g. ambiguity of words and of phrases, and the fallacy of like verbal forms (for we habitually speak of everything as though it were a particular substance) – while fallacies of combination and division and accent arise because the phrase in question or the term as altered is not the same as was intended. Even this, however, should be the same, just as the thing signified should be as well, if a refutation or proof is to be effected; e.g. if the point concerns a doublet, then you should draw the conclusion of a 'doublet', not of a 'cloak'. For the former conclusion also would be true, but it has not been proved; we need a further question to show that 'doublet' means the same thing, in order to satisfy any one who asks why you think your point proved.

Fallacies that depend on Accident are clear cases of ignoratio elenchi when once 'proof' has been defined. For the same definition ought to hold good of 'refutation' too, except that a mention of 'the contradictory' is here added: for a refutation is a proof of the contradictory. If, then, there is no proof as regards an accident of anything, there is no refutation. For supposing, when A and B are, C must necessarily be, and C is white, there is no necessity for it to be white on account of the syllogism. So, if the triangle has its angles equal to two right-angles, and it happens to be a figure, or the simplest element or starting point, it is not because it is a figure or a starting point or simplest element that it has this character. For the demonstration proves the point about it not qua figure or qua simplest element, but qua triangle. Likewise also in other cases. If, then, refutation is a proof, an argument which argued per accidens could not be a refutation. It is, however, just in this that the experts and men of science generally suffer refutation at the hand of the unscientific: for the latter meet the scientists with reasonings constituted per accidens; and the scientists for lack of the power to draw distinctions either say 'Yes' to their questions, or else people suppose them to have said 'Yes', although they have not.

Those that depend upon whether something is said in a certain respect only or said absolutely, are clear cases of ignoratio elenchi because the affirmation and the denial are not concerned with the same point. For of 'white in a certain respect' the negation is 'not white in a certain respect', while of 'white absolutely' it is 'not white, absolutely'. If, then, a man treats the admission that a thing is 'white in a certain respect' as though it were said to be white absolutely, he does not effect a refutation, but merely appears to do so owing to ignorance of what refutation is.

The clearest cases of all, however, are those that were previously described' as depending upon the definition of a 'refutation': and this is also why they were called by that name. For the appearance of a refutation is produced because of the omission in the definition, and if we divide fallacies in the above manner, we ought to set 'Defective definition' as a common mark upon them all.

Those that depend upon the assumption of the original point and upon stating as the cause what is not the cause, are clearly shown to be cases of ignoratio elenchi through the definition thereof. For the conclusion ought to come about 'because these things are so', and this does not happen where the premisses are not causes of it: and again it should come about without taking into account the original point, and this is not the case with those arguments which depend upon begging the original point.

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Those that depend upon the consequent are a branch of Accident: for the consequent is an accident, only it differs from the accident in this, that you may secure an admission of the accident in the case of one thing only (e.g. the identity of a yellow thing and honey and of a white thing and swan), whereas the consequent always involves more than one thing: for we claim that things that are the same as one and the same

thing are also the same as one another, and this is the ground of a refutation dependent on the consequent. It is, however, not always true, e.g. suppose that and B are the same as C per accidens; for both 'snow' and the 'swan' are the same as something white'. Or again, as in Melissus' argument, a man assumes that to 'have been generated' and to 'have a beginning' are the same thing, or to 'become equal' and to 'assume the same magnitude'. For because what has been generated has a beginning, he claims also that what has a beginning has been generated, and argues as though both what has been generated and what is finite were the same because each has a beginning. Likewise also in the case of things that are made equal he assumes that if things that assume one and the same magnitude become equal, then also things that become equal assume one magnitude: i.e. he assumes the consequent. Inasmuch, then, as a refutation depending on accident consists in ignorance of what a refutation is, clearly so also does a refutation depending on the consequent. We shall have further to examine this in another way as well.

Those fallacies that depend upon the making of several questions into one consist in our failure to dissect the definition of 'proposition'. For a proposition is a single statement about a single thing. For the same definition applies to 'one single thing only' and to the 'thing', simply, e.g. to 'man' and to 'one single man only' and likewise also in other cases. If, then, a 'single proposition' be one which claims a single thing of a single thing, a 'proposition', simply, will also be the putting of a question of that kind. Now since a proof starts from propositions and refutation is a proof, refutation, too, will start from propositions. If, then, a proposition is a single statement about a single thing, it is obvious that this fallacy too consists in ignorance of what a refutation is: for in it what is not a proposition appears to be one. If, then, the answerer has returned an answer as though to a single question, there will be a refutation; while if he has

returned one not really but apparently, there will be an apparent refutation of his thesis. All the types of fallacy, then, fall under ignorance of what a refutation is, some of them because the contradiction, which is the distinctive mark of a refutation, is merely apparent, and the rest failing to conform to the definition of a proof.

7

The deception comes about in the case of arguments that depend on ambiguity of words and of phrases because we are unable to divide the ambiguous term (for some terms it is not easy to divide, e.g. 'unity', 'being', and 'sameness'), while in those that depend on combination and division, it is because we suppose that it makes no difference whether the phrase be combined or divided, as is indeed the case with most phrases. Likewise also with those that depend on accent: for the lowering or raising of the voice upon a phrase is thought not to alter its meaning – with any phrase, or not with many. With those that depend on the of expression it is because of the likeness of expression. For it is hard to distinguish what kind of things are signified by the same and what by different kinds of expression: for a man who can do this is practically next door to the understanding of the truth. A special reason why a man is liable to be hurried into assent to the fallacy is that we suppose every predicate of everything to be an individual thing, and we understand it as being one with the thing: and we therefore treat it as a substance: for it is to that which is one with a thing or substance, as also to substance itself, that 'individually' and 'being' are deemed to belong in the fullest sense. For this reason, too, this type of fallacy is to be ranked among those that depend on language; in the first place, because the deception is

effected the more readily when we are inquiring into a problem in company with others than when we do so by ourselves (for an inquiry with another person is carried on by means of speech, whereas an inquiry by oneself is carried on quite as much by means of the object itself); secondly a man is liable to be deceived, even when inquiring by himself, when he takes speech as the basis of his inquiry: moreover the deception arises out of the likeness (of two different things), and the likeness arises out of the language. With those fallacies that depend upon Accident, deception comes about because we cannot distinguish the sameness and otherness of terms, i.e. their unity and multiplicity, or what kinds of predicate have all the same accidents as their subject. Likewise also with those that depend on the Consequent: for the consequent is a branch of Accident. Moreover, in many cases appearances point to this – and the claim is made that if is inseparable from B, so also is B from With those that depend upon an imperfection in the definition of a refutation, and with those that depend upon the difference between a qualified and an absolute statement, the deception consists in the smallness of the difference involved; for we treat the limitation to the particular thing or respect or manner or time as adding nothing to the meaning, and so grant the statement universally. Likewise also in the case of those that assume the original point, and those of false cause, and all that treat a number of questions as one: for in all of them the deception lies in the smallness of the difference: for our failure to be quite exact in our definition of 'premiss' and of 'proof' is due to the aforesaid reason.

8

Since we know on how many points apparent syllogisms depend, we know also on how many sophistical syllogisms and refutations may depend. By a sophistical refutation and syllogism I mean not only a syllogism or refutation which appears to be valid but is not, but also one which, though it is valid, only appears to be appropriate to the thing in question. These are those which fail to refute and prove people to be ignorant according to the nature of the thing in question, which was the function of the art of examination. Now the art of examining is a branch of dialectic: and this may prove a false conclusion because of the ignorance of the answerer. Sophistic refutations on the other hand, even though they prove the contradictory of his thesis, do not make clear whether he is ignorant: for sophists entangle the scientist as well with these arguments.

That we know them by the same line of inquiry is clear: for the same considerations which make it appear to an audience that the points required for the proof were asked in the questions and that the conclusion was proved, would make the answerer think so as well, so that false proof will occur through all or some of these means: for what a man has not been asked but thinks he has granted, he would also grant if he were asked. Of course, in some cases the moment we add the missing question, we also show up its falsity, e.g. in fallacies that depend on language and on solecism. If then, fallacious proofs of the contradictory of a thesis depend on their appearing to refute, it is clear that the considerations on which both proofs of false conclusions and an apparent refutation depend must be the same in number. Now an apparent refutation depends upon the elements involved in a genuine one: for the failure of one or other of these must make the refutation merely apparent, e.g. that which depends on the failure of the conclusion to follow

from the argument (the argument ad impossible) and that which treats two questions as one and so depends upon a flaw in the premiss, and that which depends on the substitution of an accident for an essential attribute, and – a branch of the last – that which depends upon the consequent: more over, the conclusion may follow not in fact but only verbally: then, instead of proving the contradictory universally and in the same respect and relation and manner, the fallacy may be dependent on some limit of extent or on one or other of these qualifications: moreover, there is the assumption of the original point to be proved, in violation of the clause 'without reckoning in the original point'. Thus we should have the number of considerations on which the fallacious proofs depend: for they could not depend on more, but all will depend on the points aforesaid.

A sophistical refutation is a refutation not absolutely but relatively to some one: and so is a proof, in the same way. For unless that which depends upon ambiguity assumes that the ambiguous term has a single meaning, and that which depends on like verbal forms assumes that substance is the only category, and the rest in the same way, there will be neither refutations nor proofs, either absolutely or relatively to the answerer: whereas if they do assume these things, they will stand, relatively to the answerer; but absolutely they will not stand: for they have not secured a statement that does have a single meaning, but only one that appears to have, and that only from this particular man.

9

The number of considerations on which depend the refutations of those who are refuted, we ought not to try to grasp without a knowledge of everything that is. This, however, is not the province of any special study: for possibly the sciences are infinite in number, so that obviously demonstrations may be infinite too. Now refutations may be true as well as false: for whenever it is possible to demonstrate something, it is also possible to refute the man who maintains the contradictory of the truth; e.g. if a man has stated that the diagonal is commensurate with the side of the square, one might refute him by demonstrating that it is incommensurate. Accordingly, to exhaust all possible refutations we shall have to have scientific knowledge of everything: for some refutations depend upon the principles that rule in geometry and the conclusions that follow from these, others upon those that rule in medicine, and others upon those of the other sciences. For the matter of that, the false refutations likewise belong to the number of the infinite: for according to every art there is false proof, e.g. according to geometry there is false geometrical proof, and according to medicine there is false medical proof. By 'according to the art', I mean 'according to the principles of it'. Clearly, then, it is not of all refutations, but only of those that depend upon dialectic that we need to grasp the common-place rules: for these stand in a common relation to every art and faculty. And as regards the refutation that is according to one or other of the particular sciences it is the task of that particular scientist to examine whether it is merely apparent without being real, and, if it be real, what is the reason for it: whereas it is the business of dialecticians so to examine the refutation that proceeds from the common first principles that fall under no particular special study. For if we grasp the startingpoints of the accepted proofs on any subject whatever we grasp those of the refutations current on that subject. For a refutation is the proof

of the contradictory of a given thesis, so that either one or two proofs of the contradictory constitute a refutation. We grasp, then, the number of considerations on which all such depend: if, however, we grasp this, we also grasp their solutions as well; for the objections to these are the solutions of them. We also grasp the number of considerations on which those refutations depend, that are merely apparent – apparent, I mean, not to everybody, but to people of a certain stamp; for it is an indefinite task if one is to inquire how many are the considerations that make them apparent to the man in the street. Accordingly it is clear that the dialectician's business is to be able to grasp on how many considerations depends the formation, through the common first principles, of a refutation that is either real or apparent, i.e. either dialectical or apparently dialectical, or suitable for an examination.

10

It is no true distinction between arguments which some people draw when they say that some arguments are directed against the expression, and others against the thought expressed: for it is absurd to suppose that some arguments are directed against the expression and others against the thought, and that they are not the same. For what is failure to direct an argument against the thought except what occurs whenever a man does not in using the expression think it to be used in his question in the same sense in which the person questioned granted it? And this is the same thing as to direct the argument against the expression. On the other hand, it is directed against the thought whenever a man uses the expression in the same sense which the answerer had in mind when he granted it. If now any (i.e. both the questioner and the person questioned), in dealing with

an expression with more than one meaning, were to suppose it to have one meaning – as e.g. it may be that 'Being' and 'One' have many meanings, and yet both the answerer answers and the questioner puts his question supposing it to be one, and the argument is to the effect that 'All things are one' – will this discussion be directed any more against the expression than against the thought of the person questioned? If, on the other hand, one of them supposes the expression to have many meanings, it is clear that such a discussion will not be directed against the thought. Such being the meanings of the phrases in question, they clearly cannot describe two separate classes of argument. For, in the first place, it is possible for any such argument as bears more than one meaning to be directed against the expression and against the thought, and next it is possible for any argument whatsoever; for the fact of being directed against the thought consists not in the nature of the argument, but in the special attitude of the answerer towards the points he concedes. Next, all of them may be directed to the expression. For 'to be directed against the expression' means in this doctrine 'not to be directed against the thought'. For if not all are directed against either expression or thought, there will be certain other arguments directed neither against the expression nor against the thought, whereas they say that all must be one or the other, and divide them all as directed either against the expression or against the thought, while others (they say) there are none. But in point of fact those that depend on mere expression are only a branch of those syllogisms that depend on a multiplicity of meanings. For the absurd statement has actually been made that the description 'dependent on mere expression' describes all the arguments that depend on language: whereas some of these are fallacies not because the answerer adopts a particular attitude towards them, but because the argument itself involves the asking of a question such as bears more than one meaning.

It is, too, altogether absurd to discuss Refutation without first discussing Proof: for a refutation is a proof, so that one ought to discuss proof as well before describing false refutation: for a refutation of that kind is a merely apparent proof of the contradictory of a thesis. Accordingly, the reason of the falsity will be either in the proof or in the contradiction (for mention of the 'contradiction' must be added), while sometimes it is in both, if the refutation be merely apparent. In the argument that speaking of the silent is possible it lies in the contradiction, not in the proof; in the argument that one can give what one does not possess, it lies in both; in the proof that Homer's poem is a figure through its being a cycle it lies in the proof. An argument that does not fail in either respect is a true proof.

But, to return to the point whence our argument digressed, are mathematical reasonings directed against the thought, or not? And if any one thinks 'triangle' to be a word with many meanings, and granted it in some different sense from the figure which was proved to contain two right angles, has the questioner here directed his argument against the thought of the former or not?

Moreover, if the expression bears many senses, while the answerer does not understand or suppose it to have them, surely the questioner here has directed his argument against his thought! Or how else ought he to put his question except by suggesting a distinction – suppose one's question to be speaking of the silent possible or not? – as follows, 'Is the answer «No» in one sense, but «Yes» in another?' If, then, any one were to answer that it was not possible in any sense and the other were to argue that it was, has not his argument been directed against the thought of the answerer? Yet his argument is supposed to be one of those that depend on the expression. There is not, then, any definite kind of arguments that is directed against the thought. Some arguments are, indeed, directed against the

expression: but these are not all even apparent refutations, let alone all refutations. For there are also apparent refutations which do not depend upon language, e.g. those that depend upon accident, and others.

If, however, any one claims that one should actually draw the distinction, and say, ‘By «speaking of the silent» I mean, in one sense this and in the other sense that’, surely to claim this is in the first place absurd (for sometimes the questioner does not see the ambiguity of his question, and he cannot possibly draw a distinction which he does not think to be there): in the second place, what else but this will didactic argument be? For it will make manifest the state of the case to one who has never considered, and does not know or suppose that there is any other meaning but one. For what is there to prevent the same thing also happening to us in cases where there is no double meaning? ‘Are the units in four equal to the twos? Observe that the twos are contained in four in one sense in this way, in another sense in that’. Also, ‘Is the knowledge of contraries one or not? Observe that some contraries are known, while others are unknown’. Thus the man who makes this claim seems to be unaware of the difference between didactic and dialectical argument, and of the fact that while he who argues didactically should not ask questions but make things clear himself, the other should merely ask questions.

11

Moreover, to claim a ‘Yes’ or ‘No’ answer is the business not of a man who is showing something, but of one who is holding an examination. For the art of examining is a branch of dialectic and has in view not the man who has knowledge, but the

ignorant pretender. He, then, is a dialectician who regards the common principles with their application to the particular matter in hand, while he who only appears to do this is a sophist. Now for contentious and sophistical reasoning: (1) one such is a merely apparent reasoning, on subjects on which dialectical reasoning is the proper method of examination, even though its conclusion be true: for it misleads us in regard to the cause: also (2) there are those misreasonings which do not conform to the line of inquiry proper to the particular subject, but are generally thought to conform to the art in question. For false diagrams of geometrical figures are not contentious (for the resulting fallacies conform to the subject of the art) – any more than is any false diagram that may be offered in proof of a truth – e.g. Hippocrates' figure or the squaring of the circle by means of the lunules. But Bryson's method of squaring the circle, even if the circle is thereby squared, is still sophistical because it does not conform to the subject in hand. So, then, any merely apparent reasoning about these things is a contentious argument, and any reasoning that merely appears to conform to the subject in hand, even though it be genuine reasoning, is a contentious argument: for it is merely apparent in its conformity to the subject-matter, so that it is deceptive and plays foul. For just as a foul in a race is a definite type of fault, and is a kind of foul fighting, so the art of contentious reasoning is foul fighting in disputation: for in the former case those who are resolved to win at all costs snatch at everything, and so in the latter case do contentious reasoners. Those, then, who do this in order to win the mere victory are generally considered to be contentious and quarrelsome persons, while those who do it to win a reputation with a view to making money are sophistical. For the art of sophistry is, as we said,' a kind of art of money-making from a merely apparent wisdom, and this is why they aim at a merely apparent demonstration: and quarrelsome persons and sophists both employ the same

arguments, but not with the same motives: and the same argument will be sophistical and contentious, but not in the same respect; rather, it will be contentious in so far as its aim is an apparent victory, while in so far as its aim is an apparent wisdom, it will be sophistical: for the art of sophistry is a certain appearance of wisdom without the reality. The contentious argument stands in somewhat the same relation to the dialectical as the drawer of false diagrams to the geometrician; for it beguiles by misreasoning from the same principles as dialectic uses, just as the drawer of a false diagram beguiles the geometrician. But whereas the latter is not a contentious reasoner, because he bases his false diagram on the principles and conclusions that fall under the art of geometry, the argument which is subordinate to the principles of dialectic will yet clearly be contentious as regards other subjects. Thus, e.g. though the squaring of the circle by means of the lunules is not contentious, Bryson's solution is contentious: and the former argument cannot be adapted to any subject except geometry, because it proceeds from principles that are peculiar to geometry, whereas the latter can be adapted as an argument against all the number of people who do not know what is or is not possible in each particular context: for it will apply to them all. Or there is the method whereby Antiphon squared the circle. Or again, an argument which denied that it was better to take a walk after dinner, because of Zeno's argument, would not be a proper argument for a doctor, because Zeno's argument is of general application. If, then, the relation of the contentious argument to the dialectical were exactly like that of the drawer of false diagrams to the geometrician, a contentious argument upon the aforesaid subjects could not have existed. But, as it is, the dialectical argument is not concerned with any definite kind of being, nor does it show anything, nor is it even an argument such as we find in the general philosophy of being. For all beings are not contained in any one kind, nor, if they were,

could they possibly fall under the same principles. Accordingly, no art that is a method of showing the nature of anything proceeds by asking questions: for it does not permit a man to grant whichever he likes of the two alternatives in the question: for they will not both of them yield a proof. Dialectic, on the other hand, does proceed by questioning, whereas if it were concerned to show things, it would have refrained from putting questions, even if not about everything, at least about the first principles and the special principles that apply to the particular subject in hand. For suppose the answerer not to grant these, it would then no longer have had any grounds from which to argue any longer against the objection. Dialectic is at the same time a mode of examination as well. For neither is the art of examination an accomplishment of the same kind as geometry, but one which a man may possess, even though he has not knowledge. For it is possible even for one without knowledge to hold an examination of one who is without knowledge, if also the latter grants him points taken not from thing that he knows or from the special principles of the subject under discussion but from all that range of consequences attaching to the subject which a man may indeed know without knowing the theory of the subject, but which if he do not know, he is bound to be ignorant of the theory. So then clearly the art of examining does not consist in knowledge of any definite subject. For this reason, too, it deals with everything: for every 'theory' of anything employs also certain common principles. Hence everybody, including even amateurs, makes use in a way of dialectic and the practice of examining: for all undertake to some extent a rough trial of those who profess to know things. What serves them here is the general principles: for they know these of themselves just as well as the scientist, even if in what they say they seem to the latter to go wildly astray from them. All, then, are engaged in refutation; for they take a hand as amateurs in the same task with which dialectic is concerned professionally;

and he is a dialectician who examines by the help of a theory of reasoning. Now there are many identical principles which are true of everything, though they are not such as to constitute a particular nature, i.e. a particular kind of being, but are like negative terms, while other principles are not of this kind but are special to particular subjects; accordingly it is possible from these general principles to hold an examination on everything, and that there should be a definite art of so doing, and, moreover, an art which is not of the same kind as those which demonstrate. This is why the contentious reasoner does not stand in the same condition in all respects as the drawer of a false diagram: for the contentious reasoner will not be given to misreasoning from any definite class of principles, but will deal with every class.

These, then, are the types of sophistical refutations: and that it belongs to the dialectician to study these, and to be able to effect them, is not difficult to see: for the investigation of premisses comprises the whole of this study.

12

So much, then, for apparent refutations. As for showing that the answerer is committing some fallacy, and drawing his argument into paradox – for this was the second item of the sophist's programme – in the first place, then, this is best brought about by a certain manner of questioning and through the question. For to put the question without framing it with reference to any definite subject is a good bait for these purposes: for people are more inclined to make mistakes when they talk at large, and they talk at large when they have no definite subject before them. Also the putting of several questions, even though the

position against which one is arguing be quite definite, and the claim that he shall say only what he thinks, create abundant opportunity for drawing him into paradox or fallacy, and also, whether to any of these questions he replies 'Yes' or replies 'No', of leading him on to statements against which one is well off for a line of attack. Nowadays, however, men are less able to play foul by these means than they were formerly: for people rejoin with the question, 'What has that to do with the original subject?' It is, too, an elementary rule for eliciting some fallacy or paradox that one should never put a controversial question straight away, but say that one puts it from the wish for information: for the process of inquiry thus invited gives room for an attack.

A rule specially appropriate for showing up a fallacy is the sophistic rule, that one should draw the answerer on to the kind of statements against which one is well supplied with arguments: this can be done both properly and improperly, as was said before.' Again, to draw a paradoxical statement, look and see to what school of philosophers the person arguing with you belongs, and then question him as to some point wherein their doctrine is paradoxical to most people: for with every school there is some point of that kind. It is an elementary rule in these matters to have a collection of the special 'theses' of the various schools among your propositions. The solution recommended as appropriate here, too, is to point out that the paradox does not come about because of the argument: whereas this is what his opponent always really wants.

Moreover, argue from men's wishes and their professed opinions. For people do not wish the same things as they say they wish: they say what will look best, whereas they wish what appears to be to their interest: e.g. they say that a man ought to die nobly rather than to live in pleasure, and to live in honest poverty rather than in dishonourable riches; but they wish the

opposite. Accordingly, a man who speaks according to his wishes must be led into stating the professed opinions of people, while he who speaks according to these must be led into admitting those that people keep hidden away: for in either case they are bound to introduce a paradox; for they will speak contrary either to men's professed or to their hidden opinions.

The widest range of common-place argument for leading men into paradoxical statement is that which depends on the standards of Nature and of the Law: it is so that both Callicles is drawn as arguing in the Gorgias, and that all the men of old supposed the result to come about: for nature (they said) and law are opposites, and justice is a fine thing by a legal standard, but not by that of nature. Accordingly, they said, the man whose statement agrees with the standard of nature you should meet by the standard of the law, but the man who agrees with the law by leading him to the facts of nature: for in both ways paradoxical statements may be committed. In their view the standard of nature was the truth, while that of the law was the opinion held by the majority. So that it is clear that they, too, used to try either to refute the answerer or to make him make paradoxical statements, just as the men of to-day do as well.

Some questions are such that in both forms the answer is paradoxical; e.g. 'Ought one to obey the wise or one's father?' and 'Ought one to do what is expedient or what is just?' and 'Is it preferable to suffer injustice or to do an injury?' You should lead people, then, into views opposite to the majority and to the philosophers; if any one speaks as do the expert reasoners, lead him into opposition to the majority, while if he speaks as do the majority, then into opposition to the reasoners. For some say that of necessity the happy man is just, whereas it is paradoxical to the many that a king should be happy. To lead a man into paradoxes of this sort is the same as to lead him into the opposition of the standards of nature and law: for the law

represents the opinion of the majority, whereas philosophers speak according to the standard of nature and the truth.

13

Paradoxes, then, you should seek to elicit by means of these common-place rules. Now as for making any one babble, we have already said what we mean by 'to babble'. This is the object in view in all arguments of the following kind: If it is all the same to state a term and to state its definition, the 'double' and 'double of half' are the same: if then 'double' be the 'double of half', it will be the 'double of half of half'. And if, instead of 'double', 'double of half' be again put, then the same expression will be repeated three times, 'double of half of half of half'. Also 'desire is of the pleasant, isn't it?' desire is conation for the pleasant: accordingly, 'desire' is 'conation for the pleasant for the pleasant'.

All arguments of this kind occur in dealing (1) with any relative terms which not only have relative genera, but are also themselves relative, and are rendered in relation to one and the same thing, as e.g. conation is conation for something, and desire is desire of something, and double is double of something, i.e. double of half: also in dealing (2) with any terms which, though they be not relative terms at all, yet have their substance, viz. the things of which they are the states or affections or what not, indicated as well in their definition, they being predicated of these things. Thus e.g. 'odd' is a 'number containing a middle': but there is an 'odd number': therefore there is a 'number-containing-a-middle number'. Also, if snubness be a concavity of the nose, and there be a snub nose, there is therefore a 'concave-nose nose'.

People sometimes appear to produce this result, without really producing it, because they do not add the question whether the expression 'double', just by itself, has any meaning or no, and if so, whether it has the same meaning, or a different one; but they draw their conclusion straight away. Still it seems, inasmuch as the word is the same, to have the same meaning as well.

14

We have said before what kind of thing 'solecism' is.' It is possible both to commit it, and to seem to do so without doing so, and to do so without seeming to do so. Suppose, as Protagoras used to say that menis ('wrath') and pelex ('helmet') are masculine: according to him a man who calls wrath a 'destructress' (oulomenen) commits a solecism, though he does not seem to do so to other people, where he who calls it a 'destructor' (oulomenon) commits no solecism though he seems to do so. It is clear, then, that any one could produce this effect by art as well: and for this reason many arguments seem to lead to solecism which do not really do so, as happens in the case of refutations.

Almost all apparent solecisms depend upon the word 'this' (tode), and upon occasions when the inflection denotes neither a masculine nor a feminine object but a neuter. For 'he' (outos) signifies a masculine, and 'she' (aute) feminine; but 'this' (touto), though meant to signify a neuter, often also signifies one or other of the former: e.g. 'What is this?' 'It is Calliope'; 'it is a log'; 'it is Coriscus'. Now in the masculine and feminine the inflections are all different, whereas in the neuter some are and some are not. Often, then, when 'this' (touto) has been granted,

people reason as if ‘him’ (touton) had been said: and likewise also they substitute one inflection for another. The fallacy comes about because ‘this’ (touto) is a common form of several inflections: for ‘this’ signifies sometimes ‘he’ (outos) and sometimes ‘him’ (touton). It should signify them alternately; when combined with ‘is’ (esti) it should be ‘he’, while with ‘being’ it should be ‘him’: e.g. ‘Coriscus (Kopiskos) is’, but ‘being Coriscus’ (Kopiskon). It happens in the same way in the case of feminine nouns as well, and in the case of the so-called ‘chattels’ that have feminine or masculine designations. For only those names which end in o and n, have the designation proper to a chattel, e.g. xulon (‘log’), schoinion (‘rope’); those which do not end so have that of a masculine or feminine object, though some of them we apply to chattels: e.g. askos (‘wineskin’) is a masculine noun, and kline (‘bed’) a feminine. For this reason in cases of this kind as well there will be a difference of the same sort between a construction with ‘is’ (esti) or with ‘being’ (to einai). Also, Solecism resembles in a certain way those refutations which are said to depend on the like expression of unlike things. For, just as there we come upon a material solecism, so here we come upon a verbal: for ‘man’ is both a ‘matter’ for expression and also a ‘word’: and so is white’.

It is clear, then, that for solecisms we must try to construct our argument out of the aforesaid inflections.

These, then, are the types of contentious arguments, and the subdivisions of those types, and the methods for conducting them aforesaid. But it makes no little difference if the materials for putting the question be arranged in a certain manner with a view to concealment, as in the case of dialectics. Following then upon what we have said, this must be discussed first.

15

With a view then to refutation, one resource is length – for it is difficult to keep several things in view at once; and to secure length the elementary rules that have been stated before should be employed. One resource, on the other hand, is speed; for when people are left behind they look ahead less. Moreover, there is anger and contentiousness, for when agitated everybody is less able to take care of himself. Elementary rules for producing anger are to make a show of the wish to play foul, and to be altogether shameless. Moreover, there is the putting of one's questions alternately, whether one has more than one argument leading to the same conclusion, or whether one has arguments to show both that something is so, and that it is not so: for the result is that he has to be on his guard at the same time either against more than one line, or against contrary lines, of argument. In general, all the methods described before of producing concealment are useful also for purposes of contentious argument: for the object of concealment is to avoid detection, and the object of this is to deceive.

To counter those who refuse to grant whatever they suppose to help one's argument, one should put the question negatively, as though desirous of the opposite answer, or at any rate as though one put the question without prejudice; for when it is obscure what answer one wants to secure, people are less refractory. Also when, in dealing with particulars, a man grants the individual case, when the induction is done you should often not put the universal as a question, but take it for granted and use it: for sometimes people themselves suppose that they have granted it, and also appear to the audience to have done so, for they remember the induction and assume that the questions could not have been put for nothing. In cases where there is no term to indicate the universal, still you should avail yourself of the resemblance of the particulars to suit your purpose; for

resemblance often escapes detection. Also, with a view to obtaining your premiss, you ought to put it in your question side by side with its contrary. E.g. if it were necessary to secure the admission that 'A man should obey his father in everything', ask 'Should a man obey his parents in everything, or disobey them in everything?'; and to secure that 'A number multiplied by a large number is a large number', ask 'Should one agree that it is a large number or a small one?' For then, if compelled to choose, one will be more inclined to think it a large one: for the placing of their contraries close beside them makes things look big to men, both relatively and absolutely, and worse and better.

A strong appearance of having been refuted is often produced by the most highly sophistical of all the unfair tricks of questioners, when without proving anything, instead of putting their final proposition as a question, they state it as a conclusion, as though they had proved that 'Therefore so-and-so is not true'.

It is also a sophistical trick, when a paradox has been laid down, first to propose at the start some view that is generally accepted, and then claim that the answerer shall answer what he thinks about it, and to put one's question on matters of that kind in the form 'Do you think that...?' For then, if the question be taken as one of the premisses of one's argument, either a refutation or a paradox is bound to result; if he grants the view, a refutation; if he refuses to grant it or even to admit it as the received opinion, a paradox; if he refuses to grant it, but admits that it is the received opinion, something very like a refutation, results.

Moreover, just as in rhetorical discourses, so also in those aimed at refutation, you should examine the discrepancies of the answerer's position either with his own statements, or with those of persons whom he admits to say and do aright,

moreover with those of people who are generally supposed to bear that kind of character, or who are like them, or with those of the majority or of all men. Also just as answerers, too, often, when they are in process of being confuted, draw a distinction, if their confutation is just about to take place, so questioners also should resort to this from time to time to counter objectors, pointing out, supposing that against one sense of the words the objection holds, but not against the other, that they have taken it in the latter sense, as e.g. Cleophon does in the Mandrobulus. They should also break off their argument and cut down their other lines of attack, while in answering, if a man perceives this being done beforehand, he should put in his objection and have his say first. One should also lead attacks sometimes against positions other than the one stated, on the understood condition that one cannot find lines of attack against the view laid down, as Lycophron did when ordered to deliver a eulogy upon the lyre. To counter those who demand 'Against what are you directing your effort?', since one is generally thought bound to state the charge made, while, on the other hand, some ways of stating it make the defence too easy, you should state as your aim only the general result that always happens in refutations, namely the contradiction of his thesis – viz. that your effort is to deny what he has affirmed, or to affirm what he denied: don't say that you are trying to show that the knowledge of contraries is, or is not, the same. One must not ask one's conclusion in the form of a premiss, while some conclusions should not even be put as questions at all; one should take and use it as granted.

16

We have now therefore dealt with the sources of questions, and the methods of questioning in contentious disputations: next

we have to speak of answering, and of how solutions should be made, and of what requires them, and of what use is served by arguments of this kind.

The use of them, then, is, for philosophy, twofold. For in the first place, since for the most part they depend upon the expression, they put us in a better condition for seeing in how many senses any term is used, and what kind of resemblances and what kind of differences occur between things and between their names. In the second place they are useful for one's own personal researches; for the man who is easily committed to a fallacy by some one else, and does not perceive it, is likely to incur this fate of himself also on many occasions. Thirdly and lastly, they further contribute to one's reputation, viz. the reputation of being well trained in everything, and not inexperienced in anything: for that a party to arguments should find fault with them, if he cannot definitely point out their weakness, creates a suspicion, making it seem as though it were not the truth of the matter but merely inexperience that put him out of temper.

Answerers may clearly see how to meet arguments of this kind, if our previous account was right of the sources whence fallacies came, and also our distinctions adequate of the forms of dishonesty in putting questions. But it is not the same thing take an argument in one's hand and then to see and solve its faults, as it is to be able to meet it quickly while being subjected to questions: for what we know, we often do not know in a different context. Moreover, just as in other things speed is enhanced by training, so it is with arguments too, so that supposing we are unpractised, even though a point be clear to us, we are often too late for the right moment. Sometimes too it happens as with diagrams; for there we can sometimes analyse the figure, but not construct it again: so too in refutations, though we know the thing on which the connexion of the

argument depends, we still are at a loss to split the argument apart.

17

First then, just as we say that we ought sometimes to choose to prove something in the general estimation rather than in truth, so also we have sometimes to solve arguments rather in the general estimation than according to the truth. For it is a general rule in fighting contentious persons, to treat them not as refuting, but as merely appearing to refute: for we say that they don't really prove their case, so that our object in correcting them must be to dispel the appearance of it. For if refutation be an unambiguous contradiction arrived at from certain views, there could be no need to draw distinctions against amphiboly and ambiguity: they do not effect a proof. The only motive for drawing further distinctions is that the conclusion reached looks like a refutation. What, then, we have to beware of, is not being refuted, but seeming to be, because of course the asking of amphibolies and of questions that turn upon ambiguity, and all the other tricks of that kind, conceal even a genuine refutation, and make it uncertain who is refuted and who is not. For since one has the right at the end, when the conclusion is drawn, to say that the only denial made of One's statement is ambiguous, no matter how precisely he may have addressed his argument to the very same point as oneself, it is not clear whether one has been refuted: for it is not clear whether at the moment one is speaking the truth. If, on the other hand, one had drawn a distinction, and questioned him on the ambiguous term or the amphiboly, the refutation would not have been a matter of uncertainty. Also what is incidentally the object of contentious arguers, though less so nowadays than

formerly, would have been fulfilled, namely that the person questioned should answer either 'Yes' or 'No': whereas nowadays the improper forms in which questioners put their questions compel the party questioned to add something to his answer in correction of the faultiness of the proposition as put: for certainly, if the questioner distinguishes his meaning adequately, the answerer is bound to reply either 'Yes' or 'No'.

If any one is going to suppose that an argument which turns upon ambiguity is a refutation, it will be impossible for an answerer to escape being refuted in a sense: for in the case of visible objects one is bound of necessity to deny the term one has asserted, and to assert what one has denied. For the remedy which some people have for this is quite unavailing. They say, not that Coriscus is both musical and unmusical, but that this Coriscus is musical and this Coriscus unmusical. But this will not do, for to say 'this Coriscus is unmusical', or 'musical', and to say 'this Coriscus' is so, is to use the same expression: and this he is both affirming and denying at once. 'But perhaps they do not mean the same.' Well, nor did the simple name in the former case: so where is the difference? If, however, he is to ascribe to the one person the simple title 'Coriscus', while to the other he is to add the prefix 'one' or 'this', he commits an absurdity: for the latter is no more applicable to the one than to the other: for to whichever he adds it, it makes no difference.

All the same, since if a man does not distinguish the senses of an amphiboly, it is not clear whether he has been confuted or has not been confuted, and since in arguments the right to distinguish them is granted, it is evident that to grant the question simply without drawing any distinction is a mistake, so that, even if not the man himself, at any rate his argument looks as though it had been refuted. It often happens, however, that, though they see the amphiboly, people hesitate to draw such distinctions, because of the dense crowd of persons who

propose questions of the kind, in order that they may not be thought to be obstructionists at every turn: then, though they would never have supposed that that was the point on which the argument turned, they often find themselves faced by a paradox. Accordingly, since the right of drawing the distinction is granted, one should not hesitate, as has been said before.

If people never made two questions into one question, the fallacy that turns upon ambiguity and amphiboly would not have existed either, but either genuine refutation or none. For what is the difference between asking 'Are Callias and Themistocles musical?' and what one might have asked if they, being different, had had one name? For if the term applied means more than one thing, he has asked more than one question. If then it be not right to demand simply to be given a single answer to two questions, it is evident that it is not proper to give a simple answer to any ambiguous question, not even if the predicate be true of all the subjects, as some claim that one should. For this is exactly as though he had asked 'Are Coriscus and Callias at home or not at home?', supposing them to be both in or both out: for in both cases there is a number of propositions: for though the simple answer be true, that does not make the question one. For it is possible for it to be true to answer even countless different questions when put to one, all together with either a 'Yes' or a 'No': but still one should not answer them with a single answer: for that is the death of discussion. Rather, the case is like as though different things has actually had the same name applied to them. If then, one should not give a single answer to two questions, it is evident that we should not say simply 'Yes' or 'No' in the case of ambiguous terms either: for the remark is simply a remark, not an answer at all, although among disputants such remarks are loosely deemed to be answers, because they do not see what the consequence is.

As we said, then, inasmuch as certain refutations are generally taken for such, though not such really, in the same way also certain solutions will be generally taken for solutions, though not really such. Now these, we say, must sometimes be advanced rather than the true solutions in contentious reasonings and in the encounter with ambiguity. The proper answer in saying what one thinks is to say 'Granted'; for in that way the likelihood of being refuted on a side issue is minimized. If, on the other hand, one is compelled to say something paradoxical, one should then be most careful to add that 'it seems' so: for in that way one avoids the impression of being either refuted or paradoxical. Since it is clear what is meant by 'begging the original question', and people think that they must at all costs overthrow the premisses that lie near the conclusion, and plead in excuse for refusing to grant him some of them that he is begging the original question, so whenever any one claims from us a point such as is bound to follow as a consequence from our thesis, but is false or paradoxical, we must plead the same: for the necessary consequences are generally held to be a part of the thesis itself. Moreover, whenever the universal has been secured not under a definite name, but by a comparison of instances, one should say that the questioner assumes it not in the sense in which it was granted nor in which he proposed it in the premiss: for this too is a point upon which a refutation often depends.

If one is debarred from these defences one must pass to the argument that the conclusion has not been properly shown, approaching it in the light of the aforesaid distinction between the different kinds of fallacy.

In the case, then, of names that are used literally one is bound to answer either simply or by drawing a distinction: the tacit understandings implied in our statements, e.g. in answer to questions that are not put clearly but elliptically – it is upon this

that the consequent refutation depends. For example, 'Is what belongs to Athenians the property of Athenians?' Yes. 'And so it is likewise in other cases. But observe; man belongs to the animal kingdom, doesn't he?' Yes. 'Then man is the property of the animal kingdom.' But this is a fallacy: for we say that man 'belongs to' the animal kingdom because he is an animal, just as we say that Lysander 'belongs to' the Spartans, because he is a Spartan. It is evident, then, that where the premiss put forward is not clear, one must not grant it simply.

Whenever of two things it is generally thought that if the one is true the other is true of necessity, whereas, if the other is true, the first is not true of necessity, one should, if asked which of them is true, grant the smaller one: for the larger the number of premisses, the harder it is to draw a conclusion from them. If, again, the sophist tries to secure that has a contrary while B has not, suppose what he says is true, you should say that each has a contrary, only for the one there is no established name.

Since, again, in regard to some of the views they express, most people would say that any one who did not admit them was telling a falsehood, while they would not say this in regard to some, e.g. to any matters whereon opinion is divided (for most people have no distinct view whether the soul of animals is destructible or immortal), accordingly (1) it is uncertain in which of two senses the premiss proposed is usually meant – whether as maxims are (for people call by the name of 'maxims' both true opinions and general assertions) or like the doctrine 'the diagonal of a square is incommensurate with its side': and moreover (2) whenever opinions are divided as to the truth, we then have subjects of which it is very easy to change the terminology undetected. For because of the uncertainty in which of the two senses the premiss contains the truth, one will not be thought to be playing any trick, while because of the division of opinion, one will not be thought to be telling a

falsehood. Change the terminology therefore, for the change will make the position irrefutable.

Moreover, whenever one foresees any question coming, one should put in one's objection and have one's say beforehand: for by doing so one is likely to embarrass the questioner most effectually.

18

Inasmuch as a proper solution is an exposure of false reasoning, showing on what kind of question the falsity depends, and whereas 'false reasoning' has a double meaning – for it is used either if a false conclusion has been proved, or if there is only an apparent proof and no real one – there must be both the kind of solution just described, and also the correction of a merely apparent proof, so as to show upon which of the questions the appearance depends. Thus it comes about that one solves arguments that are properly reasoned by demolishing them, whereas one solves merely apparent arguments by drawing distinctions. Again, inasmuch as of arguments that are properly reasoned some have a true and others a false conclusion, those that are false in respect of their conclusion it is possible to solve in two ways; for it is possible both by demolishing one of the premisses asked, and by showing that the conclusion is not the real state of the case: those, on the other hand, that are false in respect of the premisses can be solved only by a demolition of one of them; for the conclusion is true. So that those who wish to solve an argument should in the first place look and see if it is properly reasoned, or is unreasoned; and next, whether the conclusion be true or false, in order that we may effect the solution either by drawing some distinction or by demolishing

something, and demolishing it either in this way or in that, as was laid down before. There is a very great deal of difference between solving an argument when being subjected to questions and when not: for to foresee traps is difficult, whereas to see them at one's leisure is easier.

19

Of the refutations, then, that depend upon ambiguity and amphiboly some contain some question with more than one meaning, while others contain a conclusion bearing a number of senses: e.g. in the proof that 'speaking of the silent' is possible, the conclusion has a double meaning, while in the proof that 'he who knows does not understand what he knows' one of the questions contains an amphiboly. Also the double-edged saying is true in one context but not in another: it means something that is and something that is not.

Whenever, then, the many senses lie in the conclusion no refutation takes place unless the sophist secures as well the contradiction of the conclusion he means to prove; e.g. in the proof that 'seeing of the blind' is possible: for without the contradiction there was no refutation. Whenever, on the other hand, the many senses lie in the questions, there is no necessity to begin by denying the double-edged premiss: for this was not the goal of the argument but only its support. At the start, then, one should reply with regard to an ambiguity, whether of a term or of a phrase, in this manner, that 'in one sense it is so, and in another not so', as e.g. that 'speaking of the silent' is in one sense possible but in another not possible: also that in one sense 'one should do what must needs be done', but not in another: for 'what must needs be' bears a number of senses. If,

however, the ambiguity escapes one, one should correct it at the end by making an addition to the question: ‘Is speaking of the silent possible?’ ‘No, but to speak of while he is silent is possible.’ Also, in cases which contain the ambiguity in their premisses, one should reply in like manner: ‘Do people then not understand what they know? ‘Yes, but not those who know it in the manner described’: for it is not the same thing to say that ‘those who know cannot understand what they know’, and to say that ‘those who know something in this particular manner cannot do so’. In general, too, even though he draws his conclusion in a quite unambiguous manner, one should contend that what he has negated is not the fact which one has asserted but only its name; and that therefore there is no refutation.

20

It is evident also how one should solve those refutations that depend upon the division and combination of words: for if the expression means something different when divided and when combined, as soon as one’s opponent draws his conclusion one should take the expression in the contrary way. All such expressions as the following depend upon the combination or division of the words: ‘Was X being beaten with that with which you saw him being beaten?’ and ‘Did you see him being beaten with that with which he was being beaten?’ This fallacy has also in it an element of amphiboly in the questions, but it really depends upon combination. For the meaning that depends upon the division of the words is not really a double meaning (for the expression when divided is not the same), unless also the word that is pronounced, according to its breathing, as eros and eros is a case of double meaning. (In writing, indeed, a word

is the same whenever it is written of the same letters and in the same manner – and even there people nowadays put marks at the side to show the pronunciation – but the spoken words are not the same.) Accordingly an expression that depends upon division is not an ambiguous one. It is evident also that not all refutations depend upon ambiguity as some people say they do.

The answerer, then, must divide the expression: for 'I-saw-a-man-being-beaten with my eyes' is not the same as to say 'I saw a man being-beaten-with-my-eyes'. Also there is the argument of Euthydemus proving 'Then you know now in Sicily that there are triremes in Piraeus': and again, 'Can a good man who is a cobbler be bad?' 'No.' 'But a good man may be a bad cobbler: therefore a good cobbler will be bad.' Again, 'Things the knowledge of which is good, are good things to learn, aren't they?' 'Yes.' 'The knowledge, however, of evil is good: therefore evil is a good thing to know.' 'Yes. But, you see, evil is both evil and a thing-to-learn, so that evil is an evil-thing-to-learn, although the knowledge of evils is good.' Again, 'Is it true to say in the present moment that you are born?' 'Yes.' 'Then you are born in the present moment.' 'No; the expression as divided has a different meaning: for it is true to say-in-the-present-moment that «you are born», but not «You are born-in-the-present-moment».' Again, 'Could you do what you can, and as you can?' 'Yes.' 'But when not harping, you have the power to harp: and therefore you could harp when not harping.' 'No: he has not the power to harp-while-not-harping; merely, when he is not doing it, he has the power to do it.' Some people solve this last refutation in another way as well. For, they say, if he has granted that he can do anything in the way he can, still it does not follow that he can harp when not harping: for it has not been granted that he will do anything in every way in which he can; and it is not the same thing' to do a thing in the way he can' and 'to do it in every way in which he can'. But evidently they do not solve it properly: for of arguments that depend upon the

same point the solution is the same, whereas this will not fit all cases of the kind nor yet all ways of putting the questions: it is valid against the questioner, but not against his argument.

21

Accentuation gives rise to no fallacious arguments, either as written or as spoken, except perhaps some few that might be made up; e.g. the following argument. 'Is ou katalueis a house?' 'Yes.' 'Is then ou katalueis the negation of katalueis?' 'Yes.' 'But you said that ou katalueis is a house: therefore the house is a negation.' How one should solve this, is clear: for the word does not mean the same when spoken with an acuter and when spoken with a graver accent.

22

It is clear also how one must meet those fallacies that depend on the identical expressions of things that are not identical, seeing that we are in possession of the kinds of predications. For the one man, say, has granted, when asked, that a term denoting a substance does not belong as an attribute, while the other has shown that some attribute belongs which is in the Category of Relation or of Quantity, but is usually thought to denote a substance because of its expression; e.g. in the following argument: 'Is it possible to be doing and to have done the same thing at the same time?' 'No.' 'But, you see, it is surely possible to be seeing and to have seen the same thing at the same time, and in the same aspect.' Again, 'Is any mode of

passivity a mode of activity?' 'No.' 'Then «he is cut», «he is burnt», «he is struck by some sensible object» are alike in expression and all denote some form of passivity, while again «to say», «to run», «to see» are like one like one another in expression: but, you see, «to see» is surely a form of being struck by a sensible object; therefore it is at the same time a form of passivity and of activity.' Suppose, however, that in that case any one, after granting that it is not possible to do and to have done the same thing in the same time, were to say that it is possible to see and to have seen it, still he has not yet been refuted, suppose him to say that 'to see' is not a form of 'doing' (activity) but of 'passivity': for this question is required as well, though he is supposed by the listener to have already granted it, when he granted that 'to cut' is a form of present, and 'to have cut' a form of past, activity, and so on with the other things that have a like expression. For the listener adds the rest by himself, thinking the meaning to be alike: whereas really the meaning is not alike, though it appears to be so because of the expression. The same thing happens here as happens in cases of ambiguity: for in dealing with ambiguous expressions the tyro in argument supposes the sophist to have negated the fact which he (the tyro) affirmed, and not merely the name: whereas there still wants the question whether in using the ambiguous term he had a single meaning in view: for if he grants that that was so, the refutation will be effected.

Like the above are also the following arguments. It is asked if a man has lost what he once had and afterwards has not: for a man will no longer have ten dice even though he has only lost one die. No: rather it is that he has lost what he had before and has not now; but there is no necessity for him to have lost as much or as many things as he has not now. So then, he asks the questions as to what he has, and draws the conclusion as to the whole number that he has: for ten is a number. If then he had asked to begin with, whether a man no longer having the

number of things he once had has lost the whole number, no one would have granted it, but would have said ‘Either the whole number or one of them’. Also there is the argument that ‘a man may give what he has not got’: for he has not got only one die. No: rather it is that he has given not what he had not got, but in a manner in which he had not got it, viz. just the one. For the word ‘only’ does not signify a particular substance or quality or number, but a manner relation, e.g. that it is not coupled with any other. It is therefore just as if he had asked ‘Could a man give what he has not got?’ and, on being given the answer ‘No’, were to ask if a man could give a thing quickly when he had not got it quickly, and, on this being granted, were to conclude that ‘a man could give what he had not got’. It is quite evident that he has not proved his point: for to ‘give quickly’ is not to give a thing, but to give in a certain manner; and a man could certainly give a thing in a manner in which he has not got it, e.g. he might have got it with pleasure and give it with pain.

Like these are also all arguments of the following kind: ‘Could a man strike a blow with a hand which he has not got, or see with an eye which he has not got?’ For he has not got only one eye. Some people solve this case, where a man has more than one eye, or more than one of anything else, by saying also that he has only one. Others also solve it as they solve the refutation of the view that ‘what a man has, he has received’: for A gave only one vote; and certainly B, they say, has only one vote from A. Others, again, proceed by demolishing straight away the proposition asked, and admitting that it is quite possible to have what one has not received; e.g. to have received sweet wine, but then, owing to its going bad in the course of receipt, to have it sour. But, as was said also above,’ all these persons direct their solutions against the man, not against his argument. For if this were a genuine solution, then, suppose any one to grant the opposite, he could find no solution, just as happens in other

cases; e.g. suppose the true solution to be ‘So-and-so is partly true and partly not’, then, if the answerer grants the expression without any qualification, the sophist’s conclusion follows. If, on the other hand, the conclusion does not follow, then that could not be the true solution: and what we say in regard to the foregoing examples is that, even if all the sophist’s premisses be granted, still no proof is effected.

Moreover, the following too belong to this group of arguments. ‘If something be in writing did some one write it?’ ‘Yes.’ ‘But it is now in writing that you are seated – a false statement, though it was true at the time when it was written: therefore the statement that was written is at the same time false and true.’ But this is fallacious, for the falsity or truth of a statement or opinion indicates not a substance but a quality: for the same account applies to the case of an opinion as well. Again, ‘Is what a learner learns what he learns?’ ‘Yes.’ ‘But suppose some one learns «slow» quick’. Then his (the sophist’s) words denote not what the learner learns but how he learns it. Also, ‘Does a man tread upon what he walks through? ‘Yes.’ ‘But X walks through a whole day.’ No, rather the words denote not what he walks through, but when he walks; just as when any one uses the words ‘to drink the cup’ he denotes not what he drinks, but the vessel out of which he drinks. Also, ‘Is it either by learning or by discovery that a man knows what he knows?’ ‘Yes.’ ‘But suppose that of a pair of things he has discovered one and learned the other, the pair is not known to him by either method.’ No: ‘what’ he knows, means’ every single thing’ he knows, individually; but this does not mean ‘all the things’ he knows, collectively. Again, there is the proof that there is a ‘third man’ distinct from Man and from individual men. But that is a fallacy, for ‘Man’, and indeed every general predicate, denotes not an individual substance, but a particular quality, or the being related to something in a particular manner, or something of that sort. Likewise also in the case of ‘Coriscus’ and ‘Coriscus the

musician' there is the problem, Are they the same or different?' For the one denotes an individual substance and the other a quality, so that it cannot be isolated; though it is not the isolation which creates the 'third man', but the admission that it is an individual substance. For 'Man' cannot be an individual substance, as Callias is. Nor is the case improved one whit even if one were to call the clement he has isolated not an individual substance but a quality: for there will still be the one beside the many, just as 'Man' was. It is evident then that one must not grant that what is a common predicate applying to a class universally is an individual substance, but must say that denotes either a quality, or a relation, or a quantity, or something of that kind.

23

It is a general rule in dealing with arguments that depend on language that the solution always follows the opposite of the point on which the argument turns: e.g. if the argument depends upon combination, then the solution consists in division; if upon division, then in combination. Again, if it depends on an acute accent, the solution is a grave accent; if on a grave accent, it is an acute. If it depends on ambiguity, one can solve it by using the opposite term; e.g. if you find yourself calling something inanimate, despite your previous denial that it was so, show in what sense it is alive: if, on the other hand, one has declared it to be inanimate and the sophist has proved it to be animate, say how it is inanimate. Likewise also in a case of amphiboly. If the argument depends on likeness of expression, the opposite will be the solution. 'Could a man give what he has not got? 'No, not what he has not got; but he could give it in a way in which he has not got it, e.g. one die by itself.'

Does a man know either by learning or by discovery each thing that he knows, singly? but not the things that he knows, collectively.’ Also a man treads, perhaps, on any thing he walks through, but not on the time he walks through. Likewise also in the case of the other examples.

24

In dealing with arguments that depend on Accident, one and the same solution meets all cases. For since it is indeterminate when an attribute should be ascribed to a thing, in cases where it belongs to the accident of the thing, and since in some cases it is generally agreed and people admit that it belongs, while in others they deny that it need belong, we should therefore, as soon as the conclusion has been drawn, say in answer to them all alike, that there is no need for such an attribute to belong. One must, however, be prepared to adduce an example of the kind of attribute meant. All arguments such as the following depend upon Accident. ‘Do you know what I am going to ask you? you know the man who is approaching’, or ‘the man in the mask’? ‘Is the statue your work of art?’ or ‘Is the dog your father?’ ‘Is the product of a small number with a small number a small number?’ For it is evident in all these cases that there is no necessity for the attribute which is true of the thing’s accident to be true of the thing as well. For only to things that are indistinguishable and one in essence is it generally agreed that all the same attributes belong; whereas in the case of a good thing, to be good is not the same as to be going to be the subject of a question; nor in the case of a man approaching, or wearing a mask, is ‘to be approaching’ the same thing as ‘to be Coriscus’, so that suppose I know Coriscus, but do not know the man who is approaching, it still isn’t the case that I both know

and do not know the same man; nor, again, if this is mine and is also a work of art, is it therefore my work of art, but my property or thing or something else. (The solution is after the same manner in the other cases as well.)

Some solve these refutations by demolishing the original proposition asked: for they say that it is possible to know and not to know the same thing, only not in the same respect: accordingly, when they don't know the man who is coming towards them, but do know Corsicus, they assert that they do know and don't know the same object, but not in the same respect. Yet, as we have already remarked, the correction of arguments that depend upon the same point ought to be the same, whereas this one will not stand if one adopts the same principle in regard not to knowing something, but to being, or to being is a in a certain state, e.g. suppose that X is father, and is also yours: for if in some cases this is true and it is possible to know and not to know the same thing, yet with that case the solution stated has nothing to do. Certainly there is nothing to prevent the same argument from having a number of flaws; but it is not the exposition of any and every fault that constitutes a solution: for it is possible for a man to show that a false conclusion has been proved, but not to show on what it depends, e.g. in the case of Zeno's argument to prove that motion is impossible. So that even if any one were to try to establish that this doctrine is an impossible one, he still is mistaken, and even if he proved his case ten thousand times over, still this is no solution of Zeno's argument: for the solution was all along an exposition of false reasoning, showing on what its falsity depends. If then he has not proved his case, or is trying to establish even a true proposition, or a false one, in a false manner, to point this out is a true solution. Possibly, indeed, the present suggestion may very well apply in some cases: but in these cases, at any rate, not even this would be generally agreed: for he knows both that Coriscus is Coriscus

and that the approaching figure is approaching. To know and not to know the same thing is generally thought to be possible, when e.g. one knows that X is white, but does not realize that he is musical: for in that way he does know and not know the same thing, though not in the same respect. But as to the approaching figure and Coriscus he knows both that it is approaching and that he is Coriscus.

A like mistake to that of those whom we have mentioned is that of those who solve the proof that every number is a small number: for if, when the conclusion is not proved, they pass this over and say that a conclusion has been proved and is true, on the ground that every number is both great and small, they make a mistake.

Some people also use the principle of ambiguity to solve the aforesaid reasonings, e.g. the proof that 'X is your father', or 'son', or 'slave'. Yet it is evident that if the appearance a proof depends upon a plurality of meanings, the term, or the expression in question, ought to bear a number of literal senses, whereas no one speaks of A as being 'B's child' in the literal sense, if B is the child's master, but the combination depends upon Accident. 'Is A yours?' 'Yes.' 'And is A a child?' 'Yes.' 'Then the child A is yours,' because he happens to be both yours and a child; but he is not 'your child'.

There is also the proof that 'something «of evils» is good'; for wisdom is a 'knowledge «of evils»'. But the expression that this is 'of so-and-so' (='so-and-so's') has not a number of meanings: it means that it is 'so-and-so's property'. We may suppose of course, on the other hand, that it has a number of meanings – for we also say that man is 'of the animals', though not their property; and also that any term related to 'evils' in a way expressed by a genitive case is on that account a so-and-so 'of evils', though it is not one of the evils – but in that case the

apparently different meanings seem to depend on whether the term is used relatively or absolutely. 'Yet it is conceivably possible to find a real ambiguity in the phrase «Something of evils is good».' Perhaps, but not with regard to the phrase in question. It would occur more nearly, suppose that 'A servant is good of the wicked'; though perhaps it is not quite found even there: for a thing may be 'good' and be 'X's' without being at the same time 'X's good'. Nor is the saying that 'Man is of the animals' a phrase with a number of meanings: for a phrase does not become possessed of a number of meanings merely suppose we express it elliptically: for we express 'Give me the Iliad' by quoting half a line of it, e.g. 'Give me «Sing, goddess, of the wrath...»'

25

Those arguments which depend upon an expression that is valid of a particular thing, or in a particular respect, or place, or manner, or relation, and not valid absolutely, should be solved by considering the conclusion in relation to its contradictory, to see if any of these things can possibly have happened to it. For it is impossible for contraries and opposites and an affirmative and a negative to belong to the same thing absolutely; there is, however, nothing to prevent each from belonging in a particular respect or relation or manner, or to prevent one of them from belonging in a particular respect and the other absolutely. So that if this one belongs absolutely and that one in a particular respect, there is as yet no refutation. This is a feature one has to find in the conclusion by examining it in comparison with its contradictory.

All arguments of the following kind have this feature: 'Is it possible for what is-not to be? «No.» But, you see, it is something, despite its not being.' Likewise also, Being will not be; for it will not he some particular form of being. Is it possible for the same man at the same time to be a keeper and a breaker of his oath?' 'Can the same man at the same time both obey and disobey the same man?' Or isn't it the case that being something in particular and Being are not the same? On the other hand, Not-being, even if it be something, need not also have absolute 'being' as well. Nor if a man keeps his oath in this particular instance or in this particular respect, is he bound also to be a keeper of oaths absolutely, but he who swears that he will break his oath, and then breaks it, keeps this particular oath only; he is not a keeper of his oath: nor is the disobedient man 'obedient', though he obeys one particular command. The argument is similar, also, as regards the problem whether the same man can at the same time say what is both false and true: but it appears to be a troublesome question because it is not easy to see in which of the two connexions the word 'absolutely' is to be rendered – with 'true' or with 'false'. There is, however, nothing to prevent it from being false absolutely, though true in some particular respect or relation, i.e. being true in some things, though not 'true' absolutely. Likewise also in cases of some particular relation and place and time. For all arguments of the following kind depend upon this.' Is health, or wealth, a good thing?' 'Yes.' 'But to the fool who does not use it aright it is not a good thing: therefore it is both good and not good.' 'Is health, or political power, a good thing?' 'Yes. «But sometimes it is not particularly good: therefore the same thing is both good and not good to the same man.' Or rather there is nothing to prevent a thing, though good absolutely, being not good to a particular man, or being good to a particular man, and yet not good or here. 'Is that which the prudent man would not wish, an evil?' 'Yes.' 'But to get rid of, he would not wish the

good: therefore the good is an evil.' But that is a mistake; for it is not the same thing to say 'The good is an evil' and 'to get rid of the good is an evil'. Likewise also the argument of the thief is mistaken. For it is not the case that if the thief is an evil thing, acquiring things is also evil: what he wishes, therefore, is not what is evil but what is good; for to acquire something good is good. Also, disease is an evil thing, but not to get rid of disease. 'Is the just preferable to the unjust, and what takes place justly to what takes place unjustly? 'Yes.' 'But to to be put to death unjustly is preferable.' 'Is it just that each should have his own?' 'Yes.' 'But whatever decisions a man comes to on the strength of his personal opinion, even if it be a false opinion, are valid in law: therefore the same result is both just and unjust.' Also, should one decide in favour of him who says what is unjust?' 'The former.' 'But you see, it is just for the injured party to say fully the things he has suffered; and these are fallacies. For because to suffer a thing unjustly is preferable, unjust ways are not therefore preferable, though in this particular case the unjust may very well be better than the just. Also, to have one's own is just, while to have what is another's is not just: all the same, the decision in question may very well be a just decision, whatever it be that the opinion of the man who gave the decision supports: for because it is just in this particular case or in this particular manner, it is not also just absolutely. Likewise also, though things are unjust, there is nothing to prevent the speaking of them being just: for because to speak of things is just, there is no necessity that the things should be just, any more than because to speak of things be of use, the things need be of use. Likewise also in the case of what is just. So that it is not the case that because the things spoken of are unjust, the victory goes to him who speaks unjust things: for he speaks of things that are just to speak of, though absolutely, i.e. to suffer, they are unjust.

26

Refutations that depend on the definition of a refutation must, according to the plan sketched above, be met by comparing together the conclusion with its contradictory, and seeing that it shall involve the same attribute in the same respect and relation and manner and time. If this additional question be put at the start, you should not admit that it is impossible for the same thing to be both double and not double, but grant that it is possible, only not in such a way as was agreed to constitute a refutation of your case. All the following arguments depend upon a point of that kind. 'Does a man who knows A to be A, know the thing called A?' and in the same way, 'is one who is ignorant that A is A ignorant of the thing called A?' 'Yes.' 'But one who knows that Coriscus is Coriscus might be ignorant of the fact that he is musical, so that he both knows and is ignorant of the same thing.' Is a thing four cubits long greater than a thing three cubits long?' 'Yes.' 'But a thing might grow from three to four cubits in length; 'now what is 'greater' is greater than a 'less': accordingly the thing in question will be both greater and less than itself in the same respect.

27

As to refutations that depend on begging and assuming the original point to be proved, suppose the nature of the question to be obvious, one should not grant it, even though it be a view generally held, but should tell him the truth. Suppose, however, that it escapes one, then, thanks to the badness of arguments of that kind, one should make one's error recoil upon the questioner, and say that he has brought no argument: for a

refutation must be proved independently of the original point. Secondly, one should say that the point was granted under the impression that he intended not to use it as a premiss, but to reason against it, in the opposite way from that adopted in refutations on side issues.

28

Also, those refutations that bring one to their conclusion through the consequent you should show up in the course of the argument itself. The mode in which consequences follow is twofold. For the argument either is that as the universal follows on its particular – as (e.g.) ‘animal’ follows from ‘man’ – so does the particular on its universal: for the claim is made that if A is always found with B, then B also is always found with A. Or else it proceeds by way of the opposites of the terms involved: for if A follows B, it is claimed that A’s opposite will follow B’s opposite. On this latter claim the argument of Melissus also depends: for he claims that because that which has come to be has a beginning, that which has not come to be has none, so that if the heaven has not come to be, it is also eternal. But that is not so; for the sequence is vice versa.

29

In the case of any refutations whose reasoning depends on some addition, look and see if upon its subtraction the absurdity follows none the less: and then if so, the answerer should point this out, and say that he granted the addition not

because he really thought it, but for the sake of the argument, whereas the questioner has not used it for the purpose of his argument at all.

30

To meet those refutations which make several questions into one, one should draw a distinction between them straight away at the start. For a question must be single to which there is a single answer, so that one must not affirm or deny several things of one thing, nor one thing of many, but one of one. But just as in the case of ambiguous terms, an attribute belongs to a term sometimes in both its senses, and sometimes in neither, so that a simple answer does one, as it happens, no harm despite the fact that the question is not simple, so it is in these cases of double questions too. Whenever, then, the several attributes belong to the one subject, or the one to the many, the man who gives a simple answer encounters no obstacle even though he has committed this mistake: but whenever an attribute belongs to one subject but not to the other, or there is a question of a number of attributes belonging to a number of subjects and in one sense both belong to both, while in another sense, again, they do not, then there is trouble, so that one must beware of this. Thus (e.g.) in the following arguments: Supposing to be good and B evil, you will, if you give a single answer about both, be compelled to say that it is true to call these good, and that it is true to call them evil and likewise to call them neither good nor evil (for each of them has not each character), so that the same thing will be both good and evil and neither good nor evil. Also, since everything is the same as itself and different from anything else, inasmuch as the man who answers double questions simply can be made to say that

several things are 'the same' not as other things but 'as themselves', and also that they are different from themselves, it follows that the same things must be both the same as and different from themselves. Moreover, if what is good becomes evil while what is evil is good, then they must both become two. So of two unequal things each being equal to itself, it will follow that they are both equal and unequal to themselves.

Now these refutations fall into the province of other solutions as well: for 'both' and 'all' have more than one meaning, so that the resulting affirmation and denial of the same thing does not occur, except verbally: and this is not what we meant by a refutation. But it is clear that if there be not put a single question on a number of points, but the answerer has affirmed or denied one attribute only of one subject only, the absurdity will not come to pass.

31

With regard to those who draw one into repeating the same thing a number of times, it is clear that one must not grant that predications of relative terms have any meaning in abstraction by themselves, e.g. that 'double' is a significant term apart from the whole phrase 'double of half' merely on the ground that it figures in it. For ten figures in 'ten minus one' and in 'not do', and generally the affirmation in the negation; but for all that, suppose any one were to say, 'This is not white', he does not say that it is white. The bare word 'double', one may perhaps say, has not even any meaning at all, any more than has 'the' in 'the half': and even if it has a meaning, yet it has not the same meaning as in the combination. Nor is 'knowledge' the same thing in a specific branch of it (suppose it, e.g. to be 'medical

knowledge') as it is in general: for in general it was the 'knowledge of the knowable'. In the case of terms that are predicated of the terms through which they are defined, you should say the same thing, that the term defined is not the same in abstraction as it is in the whole phrase. For 'concave' has a general meaning which is the same in the case of a snub nose, and of a bandy leg, but when added to either substantive nothing prevents it from differentiating its meaning; in fact it bears one sense as applied to the nose, and another as applied to the leg: for in the former connexion it means 'snub' and in the latter 'bandyshaped'; i.e. it makes no difference whether you say 'a snub nose' or 'a concave nose'. Moreover, the expression must not be granted in the nominative case: for it is a falsehood. For snubness is not a concave nose but something (e.g. an affection) belonging to a nose: hence, there is no absurdity in supposing that the snub nose is a nose possessing the concavity that belongs to a nose.

32

With regard to solecisms, we have previously said what it is that appears to bring them about; the method of their solution will be clear in the course of the arguments themselves. Solecism is the result aimed at in all arguments of the following kind: 'Is a thing truly that which you truly call it?' 'Yes'. 'But, speaking of a stone, you call him real: therefore of a stone it follows that «him is real».' No: rather, talking of a stone means not saying which' but 'whom', and not 'that' but 'him'. If, then, any one were to ask, 'Is a stone him whom you truly call him?' he would be generally thought not to be speaking good Greek, any more than if he were to ask, 'Is he what you call her?' Speak in this way of a 'stick' or any neuter word, and the difference does not break

out. For this reason, also, no solecism is incurred, suppose any one asks, ‘Is a thing what you say it to be?’ ‘Yes’. ‘But, speaking of a stick, you call it real: therefore, of a stick it follows that it is real.’ ‘Stone’, however, and ‘he’ have masculine designations. Now suppose some one were to ask, ‘Can «he» be a «she» (a female)?’, and then again, ‘Well, but is not he Coriscus?’ and then were to say, ‘Then he is a «she»,’ he has not proved the solecism, even if the name ‘Coriscus’ does signify a ‘she’, if, on the other hand, the answerer does not grant this: this point must be put as an additional question: while if neither is it the fact nor does he grant it, then the sophist has not proved his case either in fact or as against the person he has been questioning. In like manner, then, in the above instance as well it must be definitely put that ‘he’ means the stone. If, however, this neither is so nor is granted, the conclusion must not be stated: though it follows apparently, because the case (the accusative), that is really unlike, appears to be like the nominative. ‘Is it true to say that this object is what you call it by name?’ ‘Yes’. ‘But you call it by the name of a shield: this object therefore is «of a shield».’ No: not necessarily, because the meaning of ‘this object’ is not ‘of a shield’ but ‘a shield’: ‘of a shield’ would be the meaning of ‘this object’s’. Nor again if ‘He is what you call him by name’, while ‘the name you call him by is Cleon’s’, is he therefore ‘Cleon’s’: for he is not ‘Cleon’s’, for what was said was that ‘He, not his, is what I call him by name’. For the question, if put in the latter way, would not even be Greek. ‘Do you know this?’ ‘Yes.’ ‘But this is he: therefore you know he’. No: rather ‘this’ has not the same meaning in ‘Do you know this?’ as in ‘This is a stone’; in the first it stands for an accusative, in the second for a nominative case. ‘When you have understanding of anything, do you understand it?’ ‘Yes.’ ‘But you have understanding of a stone: therefore you understand of a stone.’ No: the one phrase is in the genitive, ‘of a stone’, while the other is in the accusative, ‘a stone’: and what was granted

was that ‘you understand that, not of that, of which you have understanding’, so that you understand not ‘of a stone’, but ‘the stone’.

Thus that arguments of this kind do not prove solecism but merely appear to do so, and both why they so appear and how you should meet them, is clear from what has been said.

33

We must also observe that of all the arguments aforesaid it is easier with some to see why and where the reasoning leads the hearer astray, while with others it is more difficult, though often they are the same arguments as the former. For we must call an argument the same if it depends upon the same point; but the same argument is apt to be thought by some to depend on diction, by others on accident, and by others on something else, because each of them, when worked with different terms, is not so clear as it was. Accordingly, just as in fallacies that depend on ambiguity, which are generally thought to be the silliest form of fallacy, some are clear even to the man in the street (for humorous phrases nearly all depend on diction; e.g. ‘The man got the cart down from the stand’; and ‘Where are you bound?’ ‘To the yard arm’; and ‘Which cow will calve afore?’ ‘Neither, but both behind;’ and ‘Is the North wind clear?’ ‘No, indeed; for it has murdered the beggar and the merchant.» Is he a Good enough-King?’ ‘No, indeed; a Rob-son’: and so with the great majority of the rest as well), while others appear to elude the most expert (and it is a symptom of this that they often fight about their terms, e.g. whether the meaning of ‘Being’ and ‘One’ is the same in all their applications or different; for some think that ‘Being’ and ‘One’ mean the same; while others solve the

argument of Zeno and Parmenides by asserting that 'One' and 'Being' are used in a number of senses), likewise also as regards fallacies of Accident and each of the other types, some of the arguments will be easier to see while others are more difficult; also to grasp to which class a fallacy belongs, and whether it is a refutation or not a refutation, is not equally easy in all cases.

An incisive argument is one which produces the greatest perplexity: for this is the one with the sharpest fang. Now perplexity is twofold, one which occurs in reasoned arguments, respecting which of the propositions asked one is to demolish, and the other in contentious arguments, respecting the manner in which one is to assent to what is propounded. Therefore it is in syllogistic arguments that the more incisive ones produce the keenest heart-searching. Now a syllogistic argument is most incisive if from premisses that are as generally accepted as possible it demolishes a conclusion that is accepted as generally as possible. For the one argument, if the contradictory is changed about, makes all the resulting syllogisms alike in character: for always from premisses that are generally accepted it will prove a conclusion, negative or positive as the case may be, that is just as generally accepted; and therefore one is bound to feel perplexed. An argument, then, of this kind is the most incisive, viz. the one that puts its conclusion on all fours with the propositions asked; and second comes the one that argues from premisses, all of which are equally convincing: for this will produce an equal perplexity as to what kind of premiss, of those asked, one should demolish. Herein is a difficulty: for one must demolish something, but what one must demolish is uncertain. Of contentious arguments, on the other hand, the most incisive is the one which, in the first place, is characterized by an initial uncertainty whether it has been properly reasoned or not; and also whether the solution depends on a false premiss or on the drawing of a distinction; while, of the rest, the second place is held by that whose

solution clearly depends upon a distinction or a demolition, and yet it does not reveal clearly which it is of the premisses asked, whose demolition, or the drawing of a distinction within it, will bring the solution about, but even leaves it vague whether it is on the conclusion or on one of the premisses that the deception depends.

Now sometimes an argument which has not been properly reasoned is silly, supposing the assumptions required to be extremely contrary to the general view or false; but sometimes it ought not to be held in contempt. For whenever some question is left out, of the kind that concerns both the subject and the nerve of the argument, the reasoning that has both failed to secure this as well, and also failed to reason properly, is silly; but when what is omitted is some extraneous question, then it is by no means to be lightly despised, but the argument is quite respectable, though the questioner has not put his questions well.

Just as it is possible to bring a solution sometimes against the argument, at others against the questioner and his mode of questioning, and at others against neither of these, likewise also it is possible to marshal one's questions and reasoning both against the thesis, and against the answerer and against the time, whenever the solution requires a longer time to examine than the period available.

34

As to the number, then, and kind of sources whence fallacies arise in discussion, and how we are to show that our opponent is committing a fallacy and make him utter paradoxes; moreover, by the use of what materials solescism is brought

about, and how to question and what is the way to arrange the questions; moreover, as to the question what use is served by all arguments of this kind, and concerning the answerer's part, both as a whole in general, and in particular how to solve arguments and solecisms – on all these things let the foregoing discussion suffice. It remains to recall our original proposal and to bring our discussion to a close with a few words upon it.

Our programme was, then, to discover some faculty of reasoning about any theme put before us from the most generally accepted premisses that there are. For that is the essential task of the art of discussion (dialectic) and of examination (peirastic). Inasmuch, however, as it is annexed to it, on account of the near presence of the art of sophistry (sophistic), not only to be able to conduct an examination dialectically but also with a show of knowledge, we therefore proposed for our treatise not only the aforesaid aim of being able to exact an account of any view, but also the aim of ensuring that in standing up to an argument we shall defend our thesis in the same manner by means of views as generally held as possible. The reason of this we have explained; for this, too, was why Socrates used to ask questions and not to answer them; for he used to confess that he did not know. We have made clear, in the course of what precedes, the number both of the points with reference to which, and of the materials from which, this will be accomplished, and also from what sources we can become well supplied with these: we have shown, moreover, how to question or arrange the questioning as a whole, and the problems concerning the answers and solutions to be used against the reasonings of the questioner. We have also cleared up the problems concerning all other matters that belong to the same inquiry into arguments. In addition to this we have been through the subject of Fallacies, as we have already stated above.

That our programme, then, has been adequately completed is clear. But we must not omit to notice what has happened in regard to this inquiry. For in the case of all discoveries the results of previous labours that have been handed down from others have been advanced bit by bit by those who have taken them on, whereas the original discoveries generally make advance that is small at first though much more useful than the development which later springs out of them. For it may be that in everything, as the saying is, 'the first start is the main part': and for this reason also it is the most difficult; for in proportion as it is most potent in its influence, so it is smallest in its compass and therefore most difficult to see: whereas when this is once discovered, it is easier to add and develop the remainder in connexion with it. This is in fact what has happened in regard to rhetorical speeches and to practically all the other arts: for those who discovered the beginnings of them advanced them in all only a little way, whereas the celebrities of to-day are the heirs (so to speak) of a long succession of men who have advanced them bit by bit, and so have developed them to their present form, Tisias coming next after the first founders, then Thrasymachus after Tisias, and Theodorus next to him, while several people have made their several contributions to it: and therefore it is not to be wondered at that the art has attained considerable dimensions. Of this inquiry, on the other hand, it was not the case that part of the work had been thoroughly done before, while part had not. Nothing existed at all. For the training given by the paid professors of contentious arguments was like the treatment of the matter by Gorgias. For they used to hand out speeches to be learned by heart, some rhetorical, others in the form of question and answer, each side supposing that their arguments on either side generally fall among them. And therefore the teaching they gave their pupils was ready but rough. For they used to suppose that they trained people by imparting to them not the art but its products, as though any

one professing that he would impart a form of knowledge to obviate any pain in the feet, were then not to teach a man the art of shoe-making or the sources whence he can acquire anything of the kind, but were to present him with several kinds of shoes of all sorts: for he has helped him to meet his need, but has not imparted an art to him. Moreover, on the subject of Rhetoric there exists much that has been said long ago, whereas on the subject of reasoning we had nothing else of an earlier date to speak of at all, but were kept at work for a long time in experimental researches. If, then, it seems to you after inspection that, such being the situation as it existed at the start, our investigation is in a satisfactory condition compared with the other inquiries that have been developed by tradition, there must remain for all of you, or for our students, the task of extending us your pardon for the shortcomings of the inquiry, and for the discoveries thereof your warm thanks.

Aristotle – Physics

[Translated by R. P. Hardie and R. K. Gaye]

Book I

1

When the objects of an inquiry, in any department, have principles, conditions, or elements, it is through acquaintance with these that knowledge, that is to say scientific knowledge, is attained. For we do not think that we know a thing until we are acquainted with its primary conditions or first principles, and have carried our analysis as far as its simplest elements. Plainly therefore in the science of Nature, as in other branches of study, our first task will be to try to determine what relates to its principles.

The natural way of doing this is to start from the things which are more knowable and obvious to us and proceed towards those which are clearer and more knowable by nature; for the same things are not 'knowable relatively to us' and 'knowable' without qualification. So in the present inquiry we must follow this method and advance from what is more obscure by nature, but clearer to us, towards what is more clear and more knowable by nature.

Now what is to us plain and obvious at first is rather confused masses, the elements and principles of which become known to us later by analysis. Thus we must advance from generalities to particulars; for it is a whole that is best known to sense-perception, and a generality is a kind of whole, comprehending

many things within it, like parts. Much the same thing happens in the relation of the name to the formula. A name, e.g. ‘round’, means vaguely a sort of whole: its definition analyses this into its particular senses. Similarly a child begins by calling all men ‘father’, and all women ‘mother’, but later on distinguishes each of them.

2

The principles in question must be either (a) one or (b) more than one. If (a) one, it must be either (i) motionless, as Parmenides and Melissus assert, or (ii) in motion, as the physicists hold, some declaring air to be the first principle, others water. If (b) more than one, then either (i) a finite or (ii) an infinite plurality. If (i) finite (but more than one), then either two or three or four or some other number. If (ii) infinite, then either as Democritus believed one in kind, but differing in shape or form; or different in kind and even contrary.

A similar inquiry is made by those who inquire into the number of existents: for they inquire whether the ultimate constituents of existing things are one or many, and if many, whether a finite or an infinite plurality. So they too are inquiring whether the principle or element is one or many.

Now to investigate whether Being is one and motionless is not a contribution to the science of Nature. For just as the geometer has nothing more to say to one who denies the principles of his science – this being a question for a different science or for or common to all – so a man investigating principles cannot argue with one who denies their existence. For if Being is just one, and one in the way mentioned, there is a principle no longer, since a principle must be the principle of some thing or things.

To inquire therefore whether Being is one in this sense would be like arguing against any other position maintained for the sake of argument (such as the Heraclitean thesis, or such a thesis as that Being is one man) or like refuting a merely contentious argument – a description which applies to the arguments both of Melissus and of Parmenides: their premisses are false and their conclusions do not follow. Or rather the argument of Melissus is gross and palpable and offers no difficulty at all: accept one ridiculous proposition and the rest follows – a simple enough proceeding.

We physicists, on the other hand, must take for granted that the things that exist by nature are, either all or some of them, in motion which is indeed made plain by induction. Moreover, no man of science is bound to solve every kind of difficulty that may be raised, but only as many as are drawn falsely from the principles of the science: it is not our business to refute those that do not arise in this way: just as it is the duty of the geometer to refute the squaring of the circle by means of segments, but it is not his duty to refute Antiphon's proof. At the same time the holders of the theory of which we are speaking do incidentally raise physical questions, though Nature is not their subject: so it will perhaps be as well to spend a few words on them, especially as the inquiry is not without scientific interest.

The most pertinent question with which to begin will be this: In what sense is it asserted that all things are one? For 'is' is used in many senses. Do they mean that all things 'are' substance or quantities or qualities? And, further, are all things one substance – one man, one horse, or one soul – or quality and that one and the same – white or hot or something of the kind? These are all very different doctrines and all impossible to maintain.

For if both substance and quantity and quality are, then, whether these exist independently of each other or not, Being will be many.

If on the other hand it is asserted that all things are quality or quantity, then, whether substance exists or not, an absurdity results, if the impossible can properly be called absurd. For none of the others can exist independently: substance alone is independent: for everything is predicated of substance as subject. Now Melissus says that Being is infinite. It is then a quantity. For the infinite is in the category of quantity, whereas substance or quality or affection cannot be infinite except through a concomitant attribute, that is, if at the same time they are also quantities. For to define the infinite you must use quantity in your formula, but not substance or quality. If then Being is both substance and quantity, it is two, not one: if only substance, it is not infinite and has no magnitude; for to have that it will have to be a quantity.

Again, 'one' itself, no less than 'being', is used in many senses, so we must consider in what sense the word is used when it is said that the All is one.

Now we say that (a) the continuous is one or that (b) the indivisible is one, or (c) things are said to be 'one', when their essence is one and the same, as 'liquor' and 'drink'.

If (a) their One is one in the sense of continuous, it is many, for the continuous is divisible ad infinitum.

There is, indeed, a difficulty about part and whole, perhaps not relevant to the present argument, yet deserving consideration on its own account – namely, whether the part and the whole are one or more than one, and how they can be one or many, and, if they are more than one, in what sense they are more than one. (Similarly with the parts of wholes which are not

continuous.) Further, if each of the two parts is indivisibly one with the whole, the difficulty arises that they will be indivisibly one with each other also.

But to proceed: If (b) their One is one as indivisible, nothing will have quantity or quality, and so the one will not be infinite, as Melissus says – nor, indeed, limited, as Parmenides says, for though the limit is indivisible, the limited is not.

But if (c) all things are one in the sense of having the same definition, like 'raiment' and 'dress', then it turns out that they are maintaining the Heraclitean doctrine, for it will be the same thing 'to be good' and 'to be bad', and 'to be good' and 'to be not good', and so the same thing will be 'good' and 'not good', and man and horse; in fact, their view will be, not that all things are one, but that they are nothing; and that 'to be of such-and-such a quality' is the same as 'to be of such-and-such a size'.

Even the more recent of the ancient thinkers were in a pother lest the same thing should turn out in their hands both one and many. So some, like Lycophron, were led to omit 'is', others to change the mode of expression and say 'the man has been whitened' instead of 'is white', and 'walks' instead of 'is walking', for fear that if they added the word 'is' they should be making the one to be many – as if 'one' and 'being' were always used in one and the same sense. What 'is' may be many either in definition (for example 'to be white' is one thing, 'to be musical' another, yet the same thing be both, so the one is many) or by division, as the whole and its parts. On this point, indeed, they were already getting into difficulties and admitted that the one was many – as if there was any difficulty about the same thing being both one and many, provided that these are not opposites; for 'one' may mean either 'potentially one' or 'actually one'.

3

If, then, we approach the thesis in this way it seems impossible for all things to be one. Further, the arguments they use to prove their position are not difficult to expose. For both of them reason contentiously – I mean both Melissus and Parmenides. [Their premisses are false and their conclusions do not follow. Or rather the argument of Melissus is gross and palpable and offers no difficulty at all: admit one ridiculous proposition and the rest follows – a simple enough proceeding.] The fallacy of Melissus is obvious. For he supposes that the assumption 'what has come into being always has a beginning' justifies the assumption 'what has not come into being has no beginning'. Then this also is absurd, that in every case there should be a beginning of the thing – not of the time and not only in the case of coming to be in the full sense but also in the case of coming to have a quality – as if change never took place suddenly. Again, does it follow that Being, if one, is motionless? Why should it not move, the whole of it within itself, as parts of it do which are unities, e.g. this water? Again, why is qualitative change impossible? But, further, Being cannot be one in form, though it may be in what it is made of. (Even some of the physicists hold it to be one in the latter way, though not in the former.) Man obviously differs from horse in form, and contraries from each other.

The same kind of argument holds good against Parmenides also, besides any that may apply specially to his view: the answer to him being that 'this is not true' and 'that does not follow'. His assumption that one is used in a single sense only is false, because it is used in several. His conclusion does not follow, because if we take only white things, and if 'white' has a single meaning, none the less what is white will be many and not one. For what is white will not be one either in the sense that it is continuous or in the sense that it must be defined in

only one way. ‘Whiteness’ will be different from ‘what has whiteness’. Nor does this mean that there is anything that can exist separately, over and above what is white. For ‘whiteness’ and ‘that which is white’ differ in definition, not in the sense that they are things which can exist apart from each other. But Parmenides had not come in sight of this distinction.

It is necessary for him, then, to assume not only that ‘being’ has the same meaning, of whatever it is predicated, but further that it means (1) what just is and (2) what is just one.

It must be so, for (1) an attribute is predicated of some subject, so that the subject to which ‘being’ is attributed will not be, as it is something different from ‘being’. Something, therefore, which is not will be. Hence ‘substance’ will not be a predicate of anything else. For the subject cannot be a being, unless ‘being’ means several things, in such a way that each is something. But ex hypothesi ‘being’ means only one thing.

If, then, ‘substance’ is not attributed to anything, but other things are attributed to it, how does ‘substance’ mean what is rather than what is not? For suppose that ‘substance’ is also ‘white’. Since the definition of the latter is different (for being cannot even be attributed to white, as nothing is which is not ‘substance’), it follows that ‘white’ is not-being – and that not in the sense of a particular not-being, but in the sense that it is not at all. Hence ‘substance’ is not; for it is true to say that it is white, which we found to mean not-being. If to avoid this we say that even ‘white’ means substance, it follows that ‘being’ has more than one meaning.

In particular, then, Being will not have magnitude, if it is substance. For each of the two parts must he in a different sense.

(2) Substance is plainly divisible into other substances, if we consider the mere nature of a definition. For instance, if 'man' is a substance, 'animal' and 'biped' must also be substances. For if not substances, they must be attributes – and if attributes, attributes either of (a) man or of (b) some other subject. But neither is possible.

(a) An attribute is either that which may or may not belong to the subject or that in whose definition the subject of which it is an attribute is involved. Thus 'sitting' is an example of a separable attribute, while 'snubness' contains the definition of 'nose', to which we attribute snubness. Further, the definition of the whole is not contained in the definitions of the contents or elements of the definitory formula; that of 'man' for instance in 'biped', or that of 'white man' in 'white'. If then this is so, and if 'biped' is supposed to be an attribute of 'man', it must be either separable, so that 'man' might possibly not be 'biped', or the definition of 'man' must come into the definition of 'biped' – which is impossible, as the converse is the case.

(b) If, on the other hand, we suppose that 'biped' and 'animal' are attributes not of man but of something else, and are not each of them a substance, then 'man' too will be an attribute of something else. But we must assume that substance is not the attribute of anything, that the subject of which both 'biped' and 'animal' and each separately are predicated is the subject also of the complex 'biped animal'.

Are we then to say that the All is composed of indivisible substances? Some thinkers did, in point of fact, give way to both arguments. To the argument that all things are one if being means one thing, they conceded that not-being is; to that from bisection, they yielded by positing atomic magnitudes. But obviously it is not true that if being means one thing, and cannot at the same time mean the contradictory of this, there

will be nothing which is not, for even if what is not cannot be without qualification, there is no reason why it should not be a particular not-being. To say that all things will be one, if there is nothing besides Being itself, is absurd. For who understands 'being itself' to be anything but a particular substance? But if this is so, there is nothing to prevent there being many beings, as has been said.

It is, then, clearly impossible for Being to be one in this sense.

4

The physicists on the other hand have two modes of explanation.

The first set make the underlying body one either one of the three or something else which is denser than fire and rarer than air then generate everything else from this, and obtain multiplicity by condensation and rarefaction. Now these are contraries, which may be generalized into 'excess and defect'. (Compare Plato's 'Great and Small' – except that he make these his matter, the one his form, while the others treat the one which underlies as matter and the contraries as differentiae, i.e. forms).

The second set assert that the contrarieties are contained in the one and emerge from it by segregation, for example Anaximander and also all those who assert that 'what is' is one and many, like Empedocles and Anaxagoras; for they too produce other things from their mixture by segregation. These differ, however, from each other in that the former imagines a cycle of such changes, the latter a single series. Anaxagoras again made both his 'homceomerous' substances and his

contraries infinite in multitude, whereas Empedocles posits only the so-called elements.

The theory of Anaxagoras that the principles are infinite in multitude was probably due to his acceptance of the common opinion of the physicists that nothing comes into being from not-being. For this is the reason why they use the phrase ‘all things were together’ and the coming into being of such and such a kind of thing is reduced to change of quality, while some spoke of combination and separation. Moreover, the fact that the contraries proceed from each other led them to the conclusion. The one, they reasoned, must have already existed in the other; for since everything that comes into being must arise either from what is or from what is not, and it is impossible for it to arise from what is not (on this point all the physicists agree), they thought that the truth of the alternative necessarily followed, namely that things come into being out of existent things, i.e. out of things already present, but imperceptible to our senses because of the smallness of their bulk. So they assert that everything has been mixed in every. thing, because they saw everything arising out of everything. But things, as they say, appear different from one another and receive different names according to the nature of the particles which are numerically predominant among the innumerable constituents of the mixture. For nothing, they say, is purely and entirely white or black or sweet, bone or flesh, but the nature of a thing is held to be that of which it contains the most.

Now (1) the infinite qua infinite is unknowable, so that what is infinite in multitude or size is unknowable in quantity, and what is infinite in variety of kind is unknowable in quality. But the principles in question are infinite both in multitude and in kind. Therefore it is impossible to know things which are composed of them; for it is when we know the nature and

quantity of its components that we suppose we know a complex.

Further (2) if the parts of a whole may be of any size in the direction either of greatness or of smallness (by 'parts' I mean components into which a whole can be divided and which are actually present in it), it is necessary that the whole thing itself may be of any size. Clearly, therefore, since it is impossible for an animal or plant to be indefinitely big or small, neither can its parts be such, or the whole will be the same. But flesh, bone, and the like are the parts of animals, and the fruits are the parts of plants. Hence it is obvious that neither flesh, bone, nor any such thing can be of indefinite size in the direction either of the greater or of the less.

Again (3) according to the theory all such things are already present in one another and do not come into being but are constituents which are separated out, and a thing receives its designation from its chief constituent. Further, anything may come out of anything – water by segregation from flesh and flesh from water. Hence, since every finite body is exhausted by the repeated abstraction of a finite body, it seems obviously to follow that everything cannot subsist in everything else. For let flesh be extracted from water and again more flesh be produced from the remainder by repeating the process of separation: then, even though the quantity separated out will continually decrease, still it will not fall below a certain magnitude. If, therefore, the process comes to an end, everything will not be in everything else (for there will be no flesh in the remaining water); if on the other hand it does not, and further extraction is always possible, there will be an infinite multitude of finite equal particles in a finite quantity – which is impossible. Another proof may be added: Since every body must diminish in size when something is taken from it, and flesh is quantitatively definite in respect both of greatness and smallness, it is clear

that from the minimum quantity of flesh no body can be separated out; for the flesh left would be less than the minimum of flesh.

Lastly (4) in each of his infinite bodies there would be already present infinite flesh and blood and brain – having a distinct existence, however, from one another, and no less real than the infinite bodies, and each infinite: which is contrary to reason.

The statement that complete separation never will take place is correct enough, though Anaxagoras is not fully aware of what it means. For affections are indeed inseparable. If then colours and states had entered into the mixture, and if separation took place, there would be a 'white' or a 'healthy' which was nothing but white or healthy, i.e. was not the predicate of a subject. So his 'Mind' is an absurd person aiming at the impossible, if he is supposed to wish to separate them, and it is impossible to do so, both in respect of quantity and of quality – of quantity, because there is no minimum magnitude, and of quality, because affections are inseparable.

Nor is Anaxagoras right about the coming to be of homogeneous bodies. It is true there is a sense in which clay is divided into pieces of clay, but there is another in which it is not. Water and air are, and are generated 'from' each other, but not in the way in which bricks come 'from' a house and again a house 'from' bricks; and it is better to assume a smaller and finite number of principles, as Empedocles does.

5

All thinkers then agree in making the contraries principles, both those who describe the All as one and unmoved (for even

Parmenides treats hot and cold as principles under the names of fire and earth) and those too who use the rare and the dense. The same is true of Democritus also, with his plenum and void, both of which exist, be says, the one as being, the other as not-being. Again he speaks of differences in position, shape, and order, and these are genera of which the species are contraries, namely, of position, above and below, before and behind; of shape, angular and angle-less, straight and round.

It is plain then that they all in one way or another identify the contraries with the principles. And with good reason. For first principles must not be derived from one another nor from anything else, while everything has to be derived from them. But these conditions are fulfilled by the primary contraries, which are not derived from anything else because they are primary, nor from each other because they are contraries.

But we must see how this can be arrived at as a reasoned result, as well as in the way just indicated.

Our first presupposition must be that in nature nothing acts on, or is acted on by, any other thing at random, nor may anything come from anything else, unless we mean that it does so in virtue of a concomitant attribute. For how could 'white' come from 'musical', unless 'musical' happened to be an attribute of the not-white or of the black? No, 'white' comes from 'not-white' – and not from any 'not-white', but from black or some intermediate colour. Similarly, 'musical' comes to be from 'not-musical', but not from any thing other than musical, but from 'unmusical' or any intermediate state there may be.

Nor again do things pass into the first chance thing; 'white' does not pass into 'musical' (except, it may be, in virtue of a concomitant attribute), but into 'not-white' – and not into any chance thing which is not white, but into black or an intermediate colour; 'musical' passes into 'not-musical' – and

not into any chance thing other than musical, but into 'unmusical' or any intermediate state there may be.

The same holds of other things also: even things which are not simple but complex follow the same principle, but the opposite state has not received a name, so we fail to notice the fact. What is in tune must come from what is not in tune, and vice versa; the tuned passes into untunedness – and not into any untunedness, but into the corresponding opposite. It does not matter whether we take attunement, order, or composition for our illustration; the principle is obviously the same in all, and in fact applies equally to the production of a house, a statue, or any other complex. A house comes from certain things in a certain state of separation instead of conjunction, a statue (or any other thing that has been shaped) from shapelessness – each of these objects being partly order and partly composition.

If then this is true, everything that comes to be or passes away from, or passes into, its contrary or an intermediate state. But the intermediates are derived from the contraries – colours, for instance, from black and white. Everything, therefore, that comes to be by a natural process is either a contrary or a product of contraries.

Up to this point we have practically had most of the other writers on the subject with us, as I have said already: for all of them identify their elements, and what they call their principles, with the contraries, giving no reason indeed for the theory, but contrained as it were by the truth itself. They differ, however, from one another in that some assume contraries which are more primary, others contraries which are less so: some those more knowable in the order of explanation, others those more familiar to sense. For some make hot and cold, or again moist and dry, the conditions of becoming; while others

make odd and even, or again Love and Strife; and these differ from each other in the way mentioned.

Hence their principles are in one sense the same, in another different; different certainly, as indeed most people think, but the same inasmuch as they are analogous; for all are taken from the same table of columns, some of the pairs being wider, others narrower in extent. In this way then their theories are both the same and different, some better, some worse; some, as I have said, take as their contraries what is more knowable in the order of explanation, others what is more familiar to sense. (The universal is more knowable in the order of explanation, the particular in the order of sense: for explanation has to do with the universal, sense with the particular.) 'The great and the small', for example, belong to the former class, 'the dense and the rare' to the latter.

It is clear then that our principles must be contraries.

6

The next question is whether the principles are two or three or more in number.

One they cannot be, for there cannot be one contrary. Nor can they be innumerable, because, if so, Being will not be knowable: and in any one genus there is only one contrariety, and substance is one genus: also a finite number is sufficient, and a finite number, such as the principles of Empedocles, is better than an infinite multitude; for Empedocles professes to obtain from his principles all that Anaxagoras obtains from his innumerable principles. Lastly, some contraries are more primary than others, and some arise from others – for example

sweet and bitter, white and black – whereas the principles must always remain principles.

This will suffice to show that the principles are neither one nor innumerable.

Granted, then, that they are a limited number, it is plausible to suppose them more than two. For it is difficult to see how either density should be of such a nature as to act in any way on rarity or rarity on density. The same is true of any other pair of contraries; for Love does not gather Strife together and make things out of it, nor does Strife make anything out of Love, but both act on a third thing different from both. Some indeed assume more than one such thing from which they construct the world of nature.

Other objections to the view that it is not necessary to assume a third principle as a substratum may be added. (1) We do not find that the contraries constitute the substance of any thing. But what is a first principle ought not to be the predicate of any subject. If it were, there would be a principle of the supposed principle: for the subject is a principle, and prior presumably to what is predicated of it. Again (2) we hold that a substance is not contrary to another substance. How then can substance be derived from what are not substances? Or how can non-substances be prior to substance?

If then we accept both the former argument and this one, we must, to preserve both, assume a third somewhat as the substratum of the contraries, such as is spoken of by those who describe the All as one nature – water or fire or what is intermediate between them. What is intermediate seems preferable; for fire, earth, air, and water are already involved with pairs of contraries. There is, therefore, much to be said for those who make the underlying substance different from these four; of the rest, the next best choice is air, as presenting

sensible differences in a less degree than the others; and after air, water. All, however, agree in this, that they differentiate their One by means of the contraries, such as density and rarity and more and less, which may of course be generalized, as has already been said into excess and defect. Indeed this doctrine too (that the One and excess and defect are the principles of things) would appear to be of old standing, though in different forms; for the early thinkers made the two the active and the one the passive principle, whereas some of the more recent maintain the reverse.

To suppose then that the elements are three in number would seem, from these and similar considerations, a plausible view, as I said before. On the other hand, the view that they are more than three in number would seem to be untenable.

For the one substratum is sufficient to be acted on; but if we have four contraries, there will be two contrarieties, and we shall have to suppose an intermediate nature for each pair separately. If, on the other hand, the contrarieties, being two, can generate from each other, the second contrariety will be superfluous. Moreover, it is impossible that there should be more than one primary contrariety. For substance is a single genus of being, so that the principles can differ only as prior and posterior, not in genus; in a single genus there is always a single contrariety, all the other contrarieties in it being held to be reducible to one.

It is clear then that the number of elements is neither one nor more than two or three; but whether two or three is, as I said, a question of considerable difficulty.

7

We will now give our own account, approaching the question first with reference to becoming in its widest sense: for we shall be following the natural order of inquiry if we speak first of common characteristics, and then investigate the characteristics of special cases.

We say that one thing comes to be from another thing, and one sort of thing from another sort of thing, both in the case of simple and of complex things. I mean the following. We can say (1) 'man becomes musical', (2) what is 'not-musical becomes musical', or (3), the 'not-musical man becomes a musical man'. Now what becomes in (1) and (2) – 'man' and 'not musical' – I call simple, and what each becomes – 'musical' – simple also. But when (3) we say the 'not-musical man becomes a musical man', both what becomes and what it becomes are complex.

As regards one of these simple 'things that become' we say not only 'this becomes so-and-so', but also 'from being this, comes to be so-and-so', as 'from being not-musical comes to be musical'; as regards the other we do not say this in all cases, as we do not say (1) 'from being a man he came to be musical' but only 'the man became musical'.

When a 'simple' thing is said to become something, in one case (1) it survives through the process, in the other (2) it does not. For man remains a man and is such even when he becomes musical, whereas what is not musical or is unmusical does not continue to exist, either simply or combined with the subject.

These distinctions drawn, one can gather from surveying the various cases of becoming in the way we are describing that, as we say, there must always be an underlying something, namely that which becomes, and that this, though always one numerically, in form at least is not one. (By that I mean that it

can be described in different ways.) For 'to be man' is not the same as 'to be unmusical'. One part survives, the other does not: what is not an opposite survives (for 'man' survives), but 'not-musical' or 'unmusical' does not survive, nor does the compound of the two, namely 'unmusical man'.

We speak of 'becoming that from this' instead of 'this becoming that' more in the case of what does not survive the change – 'becoming musical from unmusical', not 'from man' – but there are exceptions, as we sometimes use the latter form of expression even of what survives; we speak of 'a statue coming to be from bronze', not of the 'bronze becoming a statue'. The change, however, from an opposite which does not survive is described indifferently in both ways, 'becoming that from this' or 'this becoming that'. We say both that 'the unmusical becomes musical', and that 'from unmusical he becomes musical'. And so both forms are used of the complex, 'becoming a musical man from an unmusical man', and unmusical man becoming a musical man'.

But there are different senses of 'coming to be'. In some cases we do not use the expression 'come to be', but 'come to be so-and-so'. Only substances are said to 'come to be' in the unqualified sense.

Now in all cases other than substance it is plain that there must be some subject, namely, that which becomes. For we know that when a thing comes to be of such a quantity or quality or in such a relation, time, or place, a subject is always presupposed, since substance alone is not predicated of another subject, but everything else of substance.

But that substances too, and anything else that can be said 'to be' without qualification, come to be from some substratum, will appear on examination. For we find in every case

something that underlies from which proceeds that which comes to be; for instance, animals and plants from seed.

Generally things which come to be, come to be in different ways: (1) by change of shape, as a statue; (2) by addition, as things which grow; (3) by taking away, as the Hermes from the stone; (4) by putting together, as a house; (5) by alteration, as things which 'turn' in respect of their material substance.

It is plain that these are all cases of coming to be from a substratum.

Thus, clearly, from what has been said, whatever comes to be is always complex. There is, on the one hand, (a) something which comes into existence, and again (b) something which becomes that – the latter (b) in two senses, either the subject or the opposite. By the 'opposite' I mean the 'unmusical', by the 'subject' 'man', and similarly I call the absence of shape or form or order the 'opposite', and the bronze or stone or gold the 'subject'.

Plainly then, if there are conditions and principles which constitute natural objects and from which they primarily are or have come to be – have come to be, I mean, what each is said to be in its essential nature, not what each is in respect of a concomitant attribute – plainly, I say, everything comes to be from both subject and form. For 'musical man' is composed (in a way) of 'man' and 'musical': you can analyse it into the definitions of its elements. It is clear then that what comes to be will come to be from these elements.

Now the subject is one numerically, though it is two in form. (For it is the man, the gold – the 'matter' generally – that is counted, for it is more of the nature of a 'this', and what comes to be does not come from it in virtue of a concomitant attribute; the privation, on the other hand, and the contrary are incidental

in the process.) And the positive form is one – the order, the acquired art of music, or any similar predicate.

There is a sense, therefore, in which we must declare the principles to be two, and a sense in which they are three; a sense in which the contraries are the principles – say for example the musical and the unmusical, the hot and the cold, the tuned and the untuned – and a sense in which they are not, since it is impossible for the contraries to be acted on by each other. But this difficulty also is solved by the fact that the substratum is different from the contraries, for it is itself not a contrary. The principles therefore are, in a way, not more in number than the contraries, but as it were two, nor yet precisely two, since there is a difference of essential nature, but three. For 'to be man' is different from 'to be unmusical', and 'to be unformed' from 'to be bronze'.

We have now stated the number of the principles of natural objects which are subject to generation, and how the number is reached: and it is clear that there must be a substratum for the contraries, and that the contraries must be two. (Yet in another way of putting it this is not necessary, as one of the contraries will serve to effect the change by its successive absence and presence.)

The underlying nature is an object of scientific knowledge, by an analogy. For as the bronze is to the statue, the wood to the bed, or the matter and the formless before receiving form to any thing which has form, so is the underlying nature to substance, i.e. the 'this' or existent.

This then is one principle (though not one or existent in the same sense as the 'this'), and the definition was one as we agreed; then further there is its contrary, the privation. In what sense these are two, and in what sense more, has been stated above. Briefly, we explained first that only the contraries were

principles, and later that a substratum was indispensable, and that the principles were three; our last statement has elucidated the difference between the contraries, the mutual relation of the principles, and the nature of the substratum. Whether the form or the substratum is the essential nature of a physical object is not yet clear. But that the principles are three, and in what sense, and the way in which each is a principle, is clear.

So much then for the question of the number and the nature of the principles.

8

We will now proceed to show that the difficulty of the early thinkers, as well as our own, is solved in this way alone.

The first of those who studied science were misled in their search for truth and the nature of things by their inexperience, which as it were thrust them into another path. So they say that none of the things that are either comes to be or passes out of existence, because what comes to be must do so either from what is or from what is not, both of which are impossible. For what is cannot come to be (because it is already), and from what is not nothing could have come to be (because something must be present as a substratum). So too they exaggerated the consequence of this, and went so far as to deny even the existence of a plurality of things, maintaining that only Being itself is. Such then was their opinion, and such the reason for its adoption.

Our explanation on the other hand is that the phrases 'something comes to be from what is or from what is not', 'what is not or what is does something or has something done to it or

becomes some particular thing', are to be taken (in the first way of putting our explanation) in the same sense as 'a doctor does something or has something done to him', 'is or becomes something from being a doctor.' These expressions may be taken in two senses, and so too, clearly, may 'from being', and 'being acts or is acted on'. A doctor builds a house, not qua doctor, but qua housebuilder, and turns gray, not qua doctor, but qua dark-haired. On the other hand he doctors or fails to doctor qua doctor. But we are using words most appropriately when we say that a doctor does something or undergoes something, or becomes something from being a doctor, if he does, undergoes, or becomes qua doctor. Clearly then also 'to come to be so-and-so from not-being' means 'qua not-being'.

It was through failure to make this distinction that those thinkers gave the matter up, and through this error that they went so much farther astray as to suppose that nothing else comes to be or exists apart from Being itself, thus doing away with all becoming.

We ourselves are in agreement with them in holding that nothing can be said without qualification to come from what is not. But nevertheless we maintain that a thing may 'come to be from what is not' – that is, in a qualified sense. For a thing comes to be from the privation, which in its own nature is not-being, – this not surviving as a constituent of the result. Yet this causes surprise, and it is thought impossible that something should come to be in the way described from what is not.

In the same way we maintain that nothing comes to be from being, and that being does not come to be except in a qualified sense. In that way, however, it does, just as animal might come to be from animal, and an animal of a certain kind from an animal of a certain kind. Thus, suppose a dog to come to be from a horse. The dog would then, it is true, come to be from

animal (as well as from an animal of a certain kind) but not as animal, for that is already there. But if anything is to become an animal, not in a qualified sense, it will not be from animal: and if being, not from being – nor from not-being either, for it has been explained that by ‘from not being’ we mean from not-being qua not-being.

Note further that we do not subvert the principle that everything either is or is not.

This then is one way of solving the difficulty. Another consists in pointing out that the same things can be explained in terms of potentiality and actuality. But this has been done with greater precision elsewhere. So, as we said, the difficulties which constrain people to deny the existence of some of the things we mentioned are now solved. For it was this reason which also caused some of the earlier thinkers to turn so far aside from the road which leads to coming to be and passing away and change generally. If they had come in sight of this nature, all their ignorance would have been dispelled.

9

Others, indeed, have apprehended the nature in question, but not adequately.

In the first place they allow that a thing may come to be without qualification from not being, accepting on this point the statement of Parmenides. Secondly, they think that if the substratum is one numerically, it must have also only a single potentiality – which is a very different thing.

Now we distinguish matter and privation, and hold that one of these, namely the matter, is not-being only in virtue of an attribute which it has, while the privation in its own nature is not-being; and that the matter is nearly, in a sense is, substance, while the privation in no sense is. They, on the other hand, identify their Great and Small alike with not being, and that whether they are taken together as one or separately. Their triad is therefore of quite a different kind from ours. For they got so far as to see that there must be some underlying nature, but they make it one – for even if one philosopher makes a dyad of it, which he calls Great and Small, the effect is the same, for he overlooked the other nature. For the one which persists is a joint cause, with the form, of what comes to be – a mother, as it were. But the negative part of the contrariety may often seem, if you concentrate your attention on it as an evil agent, not to exist at all.

For admitting with them that there is something divine, good, and desirable, we hold that there are two other principles, the one contrary to it, the other such as of its own nature to desire and yearn for it. But the consequence of their view is that the contrary desires its wtextinction. Yet the form cannot desire itself, for it is not defective; nor can the contrary desire it, for contraries are mutually destructive. The truth is that what desires the form is matter, as the female desires the male and the ugly the beautiful – only the ugly or the female not per se but per accidens.

The matter comes to be and ceases to be in one sense, while in another it does not. As that which contains the privation, it ceases to be in its own nature, for what ceases to be – the privation – is contained within it. But as potentiality it does not cease to be in its own nature, but is necessarily outside the sphere of becoming and ceasing to be. For if it came to be, something must have existed as a primary substratum from

which it should come and which should persist in it; but this is its own special nature, so that it will be before coming to be. (For my definition of matter is just this-the primary substratum of each thing, from which it comes to be without qualification, and which persists in the result.) And if it ceases to be it will pass into that at the last, so it will have ceased to be before ceasing to be.

The accurate determination of the first principle in respect of form, whether it is one or many and what it is or what they are, is the province of the primary type of science; so these questions may stand over till then. But of the natural, i.e. perishable, forms we shall speak in the expositions which follow.

The above, then, may be taken as sufficient to establish that there are principles and what they are and how many there are. Now let us make a fresh start and proceed.

Book II

1

Of things that exist, some exist by nature, some from other causes.

‘By nature’ the animals and their parts exist, and the plants and the simple bodies (earth, fire, air, water) – for we say that these and the like exist ‘by nature’.

All the things mentioned present a feature in which they differ from things which are not constituted by nature. Each of them has within itself a principle of motion and of stationariness (in respect of place, or of growth and decrease, or by way of alteration). On the other hand, a bed and a coat and anything else of that sort, qua receiving these designations i.e. in so far as they are products of art – have no innate impulse to change. But in so far as they happen to be composed of stone or of earth or of a mixture of the two, they do have such an impulse, and just to that extent which seems to indicate that nature is a source or cause of being moved and of being at rest in that to which it belongs primarily, in virtue of itself and not in virtue of a concomitant attribute.

I say ‘not in virtue of a concomitant attribute’, because (for instance) a man who is a doctor might cure himself. Nevertheless it is not in so far as he is a patient that he possesses the art of medicine: it merely has happened that the same man is doctor and patient – and that is why these attributes are not always found together. So it is with all other artificial products. None of them has in itself the source of its own production. But while in some cases (for instance houses and the other products of manual labour) that principle is in something else external to the thing, in others those which may cause a change in themselves in virtue of a concomitant attribute – it lies in the things themselves (but not in virtue of what they are).

‘Nature’ then is what has been stated. Things ‘have a nature’which have a principle of this kind. Each of them is a

substance; for it is a subject, and nature always implies a subject in which it inheres.

The term ‘according to nature’ is applied to all these things and also to the attributes which belong to them in virtue of what they are, for instance the property of fire to be carried upwards – which is not a ‘nature’ nor ‘has a nature’ but is ‘by nature’ or ‘according to nature’.

What nature is, then, and the meaning of the terms ‘by nature’ and ‘according to nature’, has been stated. That nature exists, it would be absurd to try to prove; for it is obvious that there are many things of this kind, and to prove what is obvious by what is not is the mark of a man who is unable to distinguish what is self-evident from what is not. (This state of mind is clearly possible. A man blind from birth might reason about colours. Presumably therefore such persons must be talking about words without any thought to correspond.)

Some identify the nature or substance of a natural object with that immediate constituent of it which taken by itself is without arrangement, e.g. the wood is the ‘nature’ of the bed, and the bronze the ‘nature’ of the statue.

As an indication of this Antiphon points out that if you planted a bed and the rotting wood acquired the power of sending up a shoot, it would not be a bed that would come up, but wood – which shows that the arrangement in accordance with the rules of the art is merely an incidental attribute, whereas the real nature is the other, which, further, persists continuously through the process of making.

But if the material of each of these objects has itself the same relation to something else, say bronze (or gold) to water, bones (or wood) to earth and so on, that (they say) would be their nature and essence. Consequently some assert earth, others fire

or air or water or some or all of these, to be the nature of the things that are. For whatever any one of them supposed to have this character – whether one thing or more than one thing – this or these he declared to be the whole of substance, all else being its affections, states, or dispositions. Every such thing they held to be eternal (for it could not pass into anything else), but other things to come into being and cease to be times without number.

This then is one account of 'nature', namely that it is the immediate material substratum of things which have in themselves a principle of motion or change.

Another account is that 'nature' is the shape or form which is specified in the definition of the thing.

For the word 'nature' is applied to what is according to nature and the natural in the same way as 'art' is applied to what is artistic or a work of art. We should not say in the latter case that there is anything artistic about a thing, if it is a bed only potentially, not yet having the form of a bed; nor should we call it a work of art. The same is true of natural compounds. What is potentially flesh or bone has not yet its own 'nature', and does not exist until it receives the form specified in the definition, which we name in defining what flesh or bone is. Thus in the second sense of 'nature' it would be the shape or form (not separable except in statement) of things which have in themselves a source of motion. (The combination of the two, e.g. man, is not 'nature' but 'by nature' or 'natural'.)

The form indeed is 'nature' rather than the matter; for a thing is more properly said to be what it is when it has attained to fulfilment than when it exists potentially. Again man is born from man, but not bed from bed. That is why people say that the figure is not the nature of a bed, but the wood is – if the bed sprouted not a bed but wood would come up. But even if the

figure is art, then on the same principle the shape of man is his nature. For man is born from man.

We also speak of a thing's nature as being exhibited in the process of growth by which its nature is attained. The 'nature' in this sense is not like 'doctoring', which leads not to the art of doctoring but to health. Doctoring must start from the art, not lead to it. But it is not in this way that nature (in the one sense) is related to nature (in the other). What grows qua growing grows from something into something. Into what then does it grow? Not into that from which it arose but into that to which it tends. The shape then is nature.

'Shape' and 'nature', it should be added, are in two senses. For the privation too is in a way form. But whether in unqualified coming to be there is privation, i.e. a contrary to what comes to be, we must consider later.

2

We have distinguished, then, the different ways in which the term 'nature' is used.

The next point to consider is how the mathematician differs from the physicist. Obviously physical bodies contain surfaces and volumes, lines and points, and these are the subject-matter of mathematics.

Further, is astronomy different from physics or a department of it? It seems absurd that the physicist should be supposed to know the nature of sun or moon, but not to know any of their essential attributes, particularly as the writers on physics

obviously do discuss their shape also and whether the earth and the world are spherical or not.

Now the mathematician, though he too treats of these things, nevertheless does not treat of them as the limits of a physical body; nor does he consider the attributes indicated as the attributes of such bodies. That is why he separates them; for in thought they are separable from motion, and it makes no difference, nor does any falsity result, if they are separated. The holders of the theory of Forms do the same, though they are not aware of it; for they separate the objects of physics, which are less separable than those of mathematics. This becomes plain if one tries to state in each of the two cases the definitions of the things and of their attributes. 'Odd' and 'even', 'straight' and 'curved', and likewise 'number', 'line', and 'figure', do not involve motion; not so 'flesh' and 'bone' and 'man' – these are defined like 'snub nose', not like 'curved'.

Similar evidence is supplied by the more physical of the branches of mathematics, such as optics, harmonics, and astronomy. These are in a way the converse of geometry. While geometry investigates physical lines but not qua physical, optics investigates mathematical lines, but qua physical, not qua mathematical.

Since 'nature' has two senses, the form and the matter, we must investigate its objects as we would the essence of snubness. That is, such things are neither independent of matter nor can be defined in terms of matter only. Here too indeed one might raise a difficulty. Since there are two natures, with which is the physicist concerned? Or should he investigate the combination of the two? But if the combination of the two, then also each severally. Does it belong then to the same or to different sciences to know each severally?

If we look at the ancients, physics would to be concerned with the matter. (It was only very slightly that Empedocles and Democritus touched on the forms and the essence.)

But if on the other hand art imitates nature, and it is the part of the same discipline to know the form and the matter up to a point (e.g. the doctor has a knowledge of health and also of bile and phlegm, in which health is realized, and the builder both of the form of the house and of the matter, namely that it is bricks and beams, and so forth): if this is so, it would be the part of physics also to know nature in both its senses.

Again, 'that for the sake of which', or the end, belongs to the same department of knowledge as the means. But the nature is the end or 'that for the sake of which'. For if a thing undergoes a continuous change and there is a stage which is last, this stage is the end or 'that for the sake of which'. (That is why the poet was carried away into making an absurd statement when he said 'he has the end for the sake of which he was born'. For not every stage that is last claims to be an end, but only that which is best.)

For the arts make their material (some simply 'make' it, others make it serviceable), and we use everything as if it was there for our sake. (We also are in a sense an end. 'That for the sake of which' has two senses: the distinction is made in our work On Philosophy.) The arts, therefore, which govern the matter and have knowledge are two, namely the art which uses the product and the art which directs the production of it. That is why the using art also is in a sense directive; but it differs in that it knows the form, whereas the art which is directive as being concerned with production knows the matter. For the helmsman knows and prescribes what sort of form a helm should have, the other from what wood it should be made and by means of what operations. In the products of art, however,

we make the material with a view to the function, whereas in the products of nature the matter is there all along.

Again, matter is a relative term: to each form there corresponds a special matter. How far then must the physicist know the form or essence? Up to a point, perhaps, as the doctor must know sinew or the smith bronze (i.e. until he understands the purpose of each): and the physicist is concerned only with things whose forms are separable indeed, but do not exist apart from matter. Man is begotten by man and by the sun as well. The mode of existence and essence of the separable it is the business of the primary type of philosophy to define.

3

Now that we have established these distinctions, we must proceed to consider causes, their character and number. Knowledge is the object of our inquiry, and men do not think they know a thing till they have grasped the 'why' of (which is to grasp its primary cause). So clearly we too must do this as regards both coming to be and passing away and every kind of physical change, in order that, knowing their principles, we may try to refer to these principles each of our problems.

In one sense, then, (1) that out of which a thing comes to be and which persists, is called 'cause', e.g. the bronze of the statue, the silver of the bowl, and the genera of which the bronze and the silver are species.

In another sense (2) the form or the archetype, i.e. the statement of the essence, and its genera, are called 'causes' (e.g. of the octave the relation of 2:1, and generally number), and the parts in the definition.

Again (3) the primary source of the change or coming to rest; e.g. the man who gave advice is a cause, the father is cause of the child, and generally what makes of what is made and what causes change of what is changed.

Again (4) in the sense of end or 'that for the sake of which' a thing is done, e.g. health is the cause of walking about. ('Why is he walking about?' we say. 'To be healthy', and, having said that, we think we have assigned the cause.) The same is true also of all the intermediate steps which are brought about through the action of something else as means towards the end, e.g. reduction of flesh, purging, drugs, or surgical instruments are means towards health. All these things are 'for the sake of' the end, though they differ from one another in that some are activities, others instruments.

This then perhaps exhausts the number of ways in which the term 'cause' is used.

As the word has several senses, it follows that there are several causes of the same thing not merely in virtue of a concomitant attribute), e.g. both the art of the sculptor and the bronze are causes of the statue. These are causes of the statue qua statue, not in virtue of anything else that it may be – only not in the same way, the one being the material cause, the other the cause whence the motion comes. Some things cause each other reciprocally, e.g. hard work causes fitness and vice versa, but again not in the same way, but the one as end, the other as the origin of change. Further the same thing is the cause of contrary results. For that which by its presence brings about one result is sometimes blamed for bringing about the contrary by its absence. Thus we ascribe the wreck of a ship to the absence of the pilot whose presence was the cause of its safety.

All the causes now mentioned fall into four familiar divisions. The letters are the causes of syllables, the material of artificial

products, fire, &c., of bodies, the parts of the whole, and the premisses of the conclusion, in the sense of 'that from which'. Of these pairs the one set are causes in the sense of substratum, e.g. the parts, the other set in the sense of essence – the whole and the combination and the form. But the seed and the doctor and the adviser, and generally the maker, are all sources whence the change or stationariness originates, while the others are causes in the sense of the end or the good of the rest; for 'that for the sake of which' means what is best and the end of the things that lead up to it. (Whether we say the 'good itself or the 'apparent good' makes no difference.)

Such then is the number and nature of the kinds of cause.

Now the modes of causation are many, though when brought under heads they too can be reduced in number. For 'cause' is used in many senses and even within the same kind one may be prior to another (e.g. the doctor and the expert are causes of health, the relation 2:1 and number of the octave), and always what is inclusive to what is particular. Another mode of causation is the incidental and its genera, e.g. in one way 'Polyclitus', in another 'sculptor' is the cause of a statue, because 'being Polyclitus' and 'sculptor' are incidentally conjoined. Also the classes in which the incidental attribute is included; thus 'a man' could be said to be the cause of a statue or, generally, 'a living creature'. An incidental attribute too may be more or less remote, e.g. suppose that 'a pale man' or 'a musical man' were said to be the cause of the statue.

All causes, both proper and incidental, may be spoken of either as potential or as actual; e.g. the cause of a house being built is either 'house-builder' or 'house-builder building'.

Similar distinctions can be made in the things of which the causes are causes, e.g. of 'this statue' or of 'statue' or of 'image' generally, of 'this bronze' or of 'bronze' or of 'material' generally.

So too with the incidental attributes. Again we may use a complex expression for either and say, e.g. neither 'Polyclitus' nor 'sculptor' but 'Polyclitus, sculptor'.

All these various uses, however, come to six in number, under each of which again the usage is twofold. Cause means either what is particular or a genus, or an incidental attribute or a genus of that, and these either as a complex or each by itself; and all six either as actual or as potential. The difference is this much, that causes which are actually at work and particular exist and cease to exist simultaneously with their effect, e.g. this healing person with this being-healed person and that house-building man with that being-built house; but this is not always true of potential causes – the house and the housebuilder do not pass away simultaneously.

In investigating the cause of each thing it is always necessary to seek what is most precise (as also in other things): thus man builds because he is a builder, and a builder builds in virtue of his art of building. This last cause then is prior: and so generally.

Further, generic effects should be assigned to generic causes, particular effects to particular causes, e.g. statue to sculptor, this statue to this sculptor; and powers are relative to possible effects, actually operating causes to things which are actually being effected.

This must suffice for our account of the number of causes and the modes of causation.

4

But chance also and spontaneity are reckoned among causes: many things are said both to be and to come to be as a result of chance and spontaneity. We must inquire therefore in what manner chance and spontaneity are present among the causes enumerated, and whether they are the same or different, and generally what chance and spontaneity are.

Some people even question whether they are real or not. They say that nothing happens by chance, but that everything which we ascribe to chance or spontaneity has some definite cause, e.g. coming 'by chance' into the market and finding there a man whom one wanted but did not expect to meet is due to one's wish to go and buy in the market. Similarly in other cases of chance it is always possible, they maintain, to find something which is the cause; but not chance, for if chance were real, it would seem strange indeed, and the question might be raised, why on earth none of the wise men of old in speaking of the causes of generation and decay took account of chance; whence it would seem that they too did not believe that anything is by chance. But there is a further circumstance that is surprising. Many things both come to be and are by chance and spontaneity, and although know that each of them can be ascribed to some cause (as the old argument said which denied chance), nevertheless they speak of some of these things as happening by chance and others not. For this reason also they ought to have at least referred to the matter in some way or other.

Certainly the early physicists found no place for chance among the causes which they recognized – love, strife, mind, fire, or the like. This is strange, whether they supposed that there is no such thing as chance or whether they thought there is but omitted to mention it – and that too when they sometimes used

it, as Empedocles does when he says that the air is not always separated into the highest region, but 'as it may chance'. At any rate he says in his cosmogony that 'it happened to run that way at that time, but it often ran otherwise.' He tells us also that most of the parts of animals came to be by chance.

There are some too who ascribe this heavenly sphere and all the worlds to spontaneity. They say that the vortex arose spontaneously, i.e. the motion that separated and arranged in its present order all that exists. This statement might well cause surprise. For they are asserting that chance is not responsible for the existence or generation of animals and plants, nature or mind or something of the kind being the cause of them (for it is not any chance thing that comes from a given seed but an olive from one kind and a man from another); and yet at the same time they assert that the heavenly sphere and the divinest of visible things arose spontaneously, having no such cause as is assigned to animals and plants. Yet if this is so, it is a fact which deserves to be dwelt upon, and something might well have been said about it. For besides the other absurdities of the statement, it is the more absurd that people should make it when they see nothing coming to be spontaneously in the heavens, but much happening by chance among the things which as they say are not due to chance; whereas we should have expected exactly the opposite.

Others there are who, indeed, believe that chance is a cause, but that it is inscrutable to human intelligence, as being a divine thing and full of mystery.

Thus we must inquire what chance and spontaneity are, whether they are the same or different, and how they fit into our division of causes.

5

First then we observe that some things always come to pass in the same way, and others for the most part. It is clearly of neither of these that chance is said to be the cause, nor can the 'effect of chance' be identified with any of the things that come to pass by necessity and always, or for the most part. But as there is a third class of events besides these two – events which all say are 'by chance' – it is plain that there is such a thing as chance and spontaneity; for we know that things of this kind are due to chance and that things due to chance are of this kind.

But, secondly, some events are for the sake of something, others not. Again, some of the former class are in accordance with deliberate intention, others not, but both are in the class of things which are for the sake of something. Hence it is clear that even among the things which are outside the necessary and the normal, there are some in connexion withwhich the phrase 'for the sake of something' is applicable. (Events that are for the sake of something include whatever may be done as a result of thought or of nature.) Things of this kind, then, when they come to pass incidental are said to be 'by chance'. For just as a thing is something either in virtue of itself or incidentally, so may it be a cause. For instance, the housebuilding faculty is in virtue of itself the cause of a house, whereas the pale or the musical is the incidental cause. That which is per se cause of the effect is determinate, but the incidental cause is indeterminable, for the possible attributes of an individual are innumerable. To resume then; when a thing of this kind comes to pass among events which are for the sake of something, it is said to be spontaneous or by chance. (The distinction between the two must be made later – for the present it is sufficient if it

is plain that both are in the sphere of things done for the sake of something.)

Example: A man is engaged in collecting subscriptions for a feast. He would have gone to such and such a place for the purpose of getting the money, if he had known. He actually went there for another purpose and it was only incidentally that he got his money by going there; and this was not due to the fact that he went there as a rule or necessarily, nor is the end effected (getting the money) a cause present in himself – it belongs to the class of things that are intentional and the result of intelligent deliberation. It is when these conditions are satisfied that the man is said to have gone 'by chance'. If he had gone of deliberate purpose and for the sake of this – if he always or normally went there when he was collecting payments – he would not be said to have gone 'by chance'.

It is clear then that chance is an incidental cause in the sphere of those actions for the sake of something which involve purpose. Intelligent reflection, then, and chance are in the same sphere, for purpose implies intelligent reflection.

It is necessary, no doubt, that the causes of what comes to pass by chance be indefinite; and that is why chance is supposed to belong to the class of the indefinite and to be inscrutable to man, and why it might be thought that, in a way, nothing occurs by chance. For all these statements are correct, because they are well grounded. Things do, in a way, occur by chance, for they occur incidentally and chance is an incidental cause. But strictly it is not the cause – without qualification – of anything; for instance, a housebuilder is the cause of a house; incidentally, a fluteplayer may be so.

And the causes of the man's coming and getting the money (when he did not come for the sake of that) are innumerable. He may have wished to see somebody or been following somebody

or avoiding somebody, or may have gone to see a spectacle. Thus to say that chance is a thing contrary to rule is correct. For 'rule' applies to what is always true or true for the most part, whereas chance belongs to a third type of event. Hence, to conclude, since causes of this kind are indefinite, chance too is indefinite. (Yet in some cases one might raise the question whether any incidental fact might be the cause of the chance occurrence, e.g. of health the fresh air or the sun's heat may be the cause, but having had one's hair cut cannot; for some incidental causes are more relevant to the effect than others.)

Chance or fortune is called 'good' when the result is good, 'evil' when it is evil. The terms 'good fortune' and 'ill fortune' are used when either result is of considerable magnitude. Thus one who comes within an ace of some great evil or great good is said to be fortunate or unfortunate. The mind affirms the essence of the attribute, ignoring the hair's breadth of difference. Further, it is with reason that good fortune is regarded as unstable; for chance is unstable, as none of the things which result from it can be invariable or normal.

Both are then, as I have said, incidental causes – both chance and spontaneity – in the sphere of things which are capable of coming to pass not necessarily, nor normally, and with reference to such of these as might come to pass for the sake of something.

6

They differ in that 'spontaneity' is the wider term. Every result of chance is from what is spontaneous, but not everything that is from what is spontaneous is from chance.

Chance and what results from chance are appropriate to agents that are capable of good fortune and of moral action generally. Therefore necessarily chance is in the sphere of moral actions. This is indicated by the fact that good fortune is thought to be the same, or nearly the same, as happiness, and happiness to be a kind of moral action, since it is well-doing. Hence what is not capable of moral action cannot do anything by chance. Thus an inanimate thing or a lower animal or a child cannot do anything by chance, because it is incapable of deliberate intention; nor can 'good fortune' or 'ill fortune' be ascribed to them, except metaphorically, as Protarchus, for example, said that the stones of which altars are made are fortunate because they are held in honour, while their fellows are trodden under foot. Even these things, however, can in a way be affected by chance, when one who is dealing with them does something to them by chance, but not otherwise.

The spontaneous on the other hand is found both in the lower animals and in many inanimate objects. We say, for example, that the horse came 'spontaneously', because, though his coming saved him, he did not come for the sake of safety. Again, the tripod fell 'of itself', because, though when it fell it stood on its feet so as to serve for a seat, it did not fall for the sake of that.

Hence it is clear that events which (1) belong to the general class of things that may come to pass for the sake of something, (2) do not come to pass for the sake of what actually results, and (3) have an external cause, may be described by the phrase 'from spontaneity'. These 'spontaneous' events are said to be 'from chance' if they have the further characteristics of being the objects of deliberate intention and due to agents capable of that mode of action. This is indicated by the phrase 'in vain', which is used when A which is for the sake of B, does not result in B. For instance, taking a walk is for the sake of evacuation of

the bowels; if this does not follow after walking, we say that we have walked 'in vain' and that the walking was 'vain'. This implies that what is naturally the means to an end is 'in vain', when it does not effect the end towards which it was the natural means – for it would be absurd for a man to say that he had bathed in vain because the sun was not eclipsed, since the one was not done with a view to the other. Thus the spontaneous is even according to its derivation the case in which the thing itself happens in vain. The stone that struck the man did not fall for the purpose of striking him; therefore it fell spontaneously, because it might have fallen by the action of an agent and for the purpose of striking. The difference between spontaneity and what results by chance is greatest in things that come to be by nature; for when anything comes to be contrary to nature, we do not say that it came to be by chance, but by spontaneity. Yet strictly this too is different from the spontaneous proper; for the cause of the latter is external, that of the former internal.

We have now explained what chance is and what spontaneity is, and in what they differ from each other. Both belong to the mode of causation 'source of change', for either some natural or some intelligent agent is always the cause; but in this sort of causation the number of possible causes is infinite.

Spontaneity and chance are causes of effects which though they might result from intelligence or nature, have in fact been caused by something incidentally. Now since nothing which is incidental is prior to what is per se, it is clear that no incidental cause can be prior to a cause per se. Spontaneity and chance, therefore, are posterior to intelligence and nature. Hence, however true it may be that the heavens are due to spontaneity, it will still be true that intelligence and nature will be prior causes of this All and of many things in it besides.

7

It is clear then that there are causes, and that the number of them is what we have stated. The number is the same as that of the things comprehended under the question 'why'. The 'why' is referred ultimately either (1), in things which do not involve motion, e.g. in mathematics, to the 'what' (to the definition of 'straight line' or 'commensurable', &c.), or (2) to what initiated a motion, e.g. 'why did they go to war? – because there had been a raid'; or (3) we are inquiring 'for the sake of what?' – 'that they may rule'; or (4), in the case of things that come into being, we are looking for the matter. The causes, therefore, are these and so many in number.

Now, the causes being four, it is the business of the physicist to know about them all, and if he refers his problems back to all of them, he will assign the 'why' in the way proper to his science – the matter, the form, the mover, 'that for the sake of which'. The last three often coincide; for the 'what' and 'that for the sake of which' are one, while the primary source of motion is the same in species as these (for man generates man), and so too, in general, are all things which cause movement by being themselves moved; and such as are not of this kind are no longer inside the province of physics, for they cause motion not by possessing motion or a source of motion in themselves, but being themselves incapable of motion. Hence there are three branches of study, one of things which are incapable of motion, the second of things in motion, but indestructible, the third of destructible things.

The question 'why', then, is answered by reference to the matter, to the form, and to the primary moving cause. For in

respect of coming to be it is mostly in this last way that causes are investigated – 'what comes to be after what? what was the primary agent or patient?' and so at each step of the series.

Now the principles which cause motion in a physical way are two, of which one is not physical, as it has no principle of motion in itself. Of this kind is whatever causes movement, not being itself moved, such as (1) that which is completely unchangeable, the primary reality, and (2) the essence of that which is coming to be, i.e. the form; for this is the end or 'that for the sake of which'. Hence since nature is for the sake of something, we must know this cause also. We must explain the 'why' in all the senses of the term, namely, (1) that from this that will necessarily result ('from this' either without qualification or in most cases); (2) that 'this must be so if that is to be so' (as the conclusion presupposes the premisses); (3) that this was the essence of the thing; and (4) because it is better thus (not without qualification, but with reference to the essential nature in each case).

8

We must explain then (1) that Nature belongs to the class of causes which act for the sake of something; (2) about the necessary and its place in physical problems, for all writers ascribe things to this cause, arguing that since the hot and the cold, &c., are of such and such a kind, therefore certain things necessarily are and come to be – and if they mention any other cause (one his 'friendship and strife', another his 'mind'), it is only to touch on it, and then good-bye to it.

A difficulty presents itself: why should not nature work, not for the sake of something, nor because it is better so, but just as the

sky rains, not in order to make the corn grow, but of necessity? What is drawn up must cool, and what has been cooled must become water and descend, the result of this being that the corn grows. Similarly if a man's crop is spoiled on the threshing-floor, the rain did not fall for the sake of this – in order that the crop might be spoiled – but that result just followed. Why then should it not be the same with the parts in nature, e.g. that our teeth should come up of necessity – the front teeth sharp, fitted for tearing, the molars broad and useful for grinding down the food – since they did not arise for this end, but it was merely a coincident result; and so with all other parts in which we suppose that there is purpose? Wherever then all the parts came about just what they would have been if they had come be for an end, such things survived, being organized spontaneously in a fitting way; whereas those which grew otherwise perished and continue to perish, as Empedocles says his 'man-faced ox-progeny' did.

Such are the arguments (and others of the kind) which may cause difficulty on this point. Yet it is impossible that this should be the true view. For teeth and all other natural things either invariably or normally come about in a given way; but of not one of the results of chance or spontaneity is this true. We do not ascribe to chance or mere coincidence the frequency of rain in winter, but frequent rain in summer we do; nor heat in the dog-days, but only if we have it in winter. If then, it is agreed that things are either the result of coincidence or for an end, and these cannot be the result of coincidence or spontaneity, it follows that they must be for an end; and that such things are all due to nature even the champions of the theory which is before us would agree. Therefore action for an end is present in things which come to be and are by nature.

Further, where a series has a completion, all the preceding steps are for the sake of that. Now surely as in intelligent action, so in

nature; and as in nature, so it is in each action, if nothing interferes. Now intelligent action is for the sake of an end; therefore the nature of things also is so. Thus if a house, e.g. had been a thing made by nature, it would have been made in the same way as it is now by art; and if things made by nature were made also by art, they would come to be in the same way as by nature. Each step then in the series is for the sake of the next; and generally art partly completes what nature cannot bring to a finish, and partly imitates her. If, therefore, artificial products are for the sake of an end, so clearly also are natural products. The relation of the later to the earlier terms of the series is the same in both. This is most obvious in the animals other than man: they make things neither by art nor after inquiry or deliberation. Wherefore people discuss whether it is by intelligence or by some other faculty that these creatures work,spiders, ants, and the like. By gradual advance in this direction we come to see clearly that in plants too that is produced which is conducive to the end-leaves, e.g. grow to provide shade for the fruit. If then it is both by nature and for an end that the swallow makes its nest and the spider its web, and plants grow leaves for the sake of the fruit and send their roots down (not up) for the sake of nourishment, it is plain that this kind of cause is operative in things which come to be and are by nature. And since 'nature' means two things, the matter and the form, of which the latter is the end, and since all the rest is for the sake of the end, the form must be the cause in the sense of 'that for the sake of which'.

Now mistakes come to pass even in the operations of art: the grammarian makes a mistake in writing and the doctor pours out the wrong dose. Hence clearly mistakes are possible in the operations of nature also. If then in art there are cases in which what is rightly produced serves a purpose, and if where mistakes occur there was a purpose in what was attempted, only it was not attained, so must it be also in natural products,

and monstrosities will be failures in the purposive effort. Thus in the original combinations the 'ox-progeny' if they failed to reach a determinate end must have arisen through the corruption of some principle corresponding to what is now the seed.

Further, seed must have come into being first, and not straightway the animals: the words 'whole-natured first...' must have meant seed.

Again, in plants too we find the relation of means to end, though the degree of organization is less. Were there then in plants also 'olive-headed vine-progeny', like the 'man-headed ox-progeny', or not? An absurd suggestion; yet there must have been, if there were such things among animals.

Moreover, among the seeds anything must have come to be at random. But the person who asserts this entirely does away with 'nature' and what exists 'by nature'. For those things are natural which, by a continuous movement originated from an internal principle, arrive at some completion: the same completion is not reached from every principle; nor any chance completion, but always the tendency in each is towards the same end, if there is no impediment.

The end and the means towards it may come about by chance. We say, for instance, that a stranger has come by chance, paid the ransom, and gone away, when he does so as if he had come for that purpose, though it was not for that that he came. This is incidental, for chance is an incidental cause, as I remarked before. But when an event takes place always or for the most part, it is not incidental or by chance. In natural products the sequence is invariable, if there is no impediment.

It is absurd to suppose that purpose is not present because we do not observe the agent deliberating. Art does not deliberate. If

the ship-building art were in the wood, it would produce the same results by nature. If, therefore, purpose is present in art, it is present also in nature. The best illustration is a doctor doctoring himself: nature is like that.

It is plain then that nature is a cause, a cause that operates for a purpose.

9

As regards what is ‘of necessity’, we must ask whether the necessity is ‘hypothetical’, or ‘simple’ as well. The current view places what is of necessity in the process of production, just as if one were to suppose that the wall of a house necessarily comes to be because what is heavy is naturally carried downwards and what is light to the top, wherefore the stones and foundations take the lowest place, with earth above because it is lighter, and wood at the top of all as being the lightest. Whereas, though the wall does not come to be without these, it is not due to these, except as its material cause: it comes to be for the sake of sheltering and guarding certain things. Similarly in all other things which involve production for an end; the product cannot come to be without things which have a necessary nature, but it is not due to these (except as its material); it comes to be for an end. For instance, why is a saw such as it is? To effect so-and-so and for the sake of so-and-so. This end, however, cannot be realized unless the saw is made of iron. It is, therefore, necessary for it to be of iron, it we are to have a saw and perform the operation of sawing. What is necessary then, is necessary on a hypothesis; it is not a result necessarily determined by antecedents. Necessity is in the matter, while ‘that for the sake of which’ is in the definition.

Necessity in mathematics is in a way similar to necessity in things which come to be through the operation of nature. Since a straight line is what it is, it is necessary that the angles of a triangle should equal two right angles. But not conversely; though if the angles are not equal to two right angles, then the straight line is not what it is either. But in things which come to be for an end, the reverse is true. If the end is to exist or does exist, that also which precedes it will exist or does exist; otherwise just as there, if – the conclusion is not true, the premiss will not be true, so here the end or 'that for the sake of which' will not exist. For this too is itself a starting-point, but of the reasoning, not of the action; while in mathematics the starting-point is the starting-point of the reasoning only, as there is no action. If then there is to be a house, such-and-such things must be made or be there already or exist, or generally the matter relative to the end, bricks and stones if it is a house. But the end is not due to these except as the matter, nor will it come to exist because of them. Yet if they do not exist at all, neither will the house, or the saw – the former in the absence of stones, the latter in the absence of iron – just as in the other case the premisses will not be true, if the angles of the triangle are not equal to two right angles.

The necessary in nature, then, is plainly what we call by the name of matter, and the changes in it. Both causes must be stated by the physicist, but especially the end; for that is the cause of the matter, not vice versa; and the end is 'that for the sake of which', and the beginning starts from the definition or essence; as in artificial products, since a house is of such-and-such a kind, certain things must necessarily come to be or be there already, or since health is this, these things must necessarily come to be or be there already. Similarly if man is this, then these; if these, then those. Perhaps the necessary is present also in the definition. For if one defines the operation of sawing as being a certain kind of dividing, then this cannot

come about unless the saw has teeth of a certain kind; and these cannot be unless it is of iron. For in the definition too there are some parts that are, as it were, its matter.

Book III

1

Nature has been defined as a 'principle of motion and change', and it is the subject of our inquiry. We must therefore see that we understand the meaning of 'motion'; for if it were unknown, the meaning of 'nature' too would be unknown.

When we have determined the nature of motion, our next task will be to attack in the same way the terms which are involved in it. Now motion is supposed to belong to the class of things which are continuous; and the infinite presents itself first in the continuous – that is how it comes about that 'infinite' is often used in definitions of the continuous ('what is infinitely divisible is continuous'). Besides these, place, void, and time are thought to be necessary conditions of motion.

Clearly, then, for these reasons and also because the attributes mentioned are common to, and coextensive with, all the objects of our science, we must first take each of them in hand and discuss it. For the investigation of special attributes comes after that of the common attributes.

To begin then, as we said, with motion.

We may start by distinguishing (1) what exists in a state of fulfilment only, (2) what exists as potential, (3) what exists as potential and also in fulfilment – one being a 'this', another 'so much', a third 'such', and similarly in each of the other modes of the predication of being.

Further, the word 'relative' is used with reference to (1) excess and defect, (2) agent and patient and generally what can move and what can be moved. For 'what can cause movement' is relative to 'what can be moved', and vice versa.

Again, there is no such thing as motion over and above the things. It is always with respect to substance or to quantity or to quality or to place that what changes changes. But it is impossible, as we assert, to find anything common to these which is neither 'this' nor quantum nor quale nor any of the other predicates. Hence neither will motion and change have reference to something over and above the things mentioned, for there is nothing over and above them.

Now each of these belongs to all its subjects in either of two ways: namely (1) substance – the one is positive form, the other privation; (2) in quality, white and black; (3) in quantity, complete and incomplete; (4) in respect of locomotion, upwards and downwards or light and heavy. Hence there are as many types of motion or change as there are meanings of the word 'is'.

We have now before us the distinctions in the various classes of being between what is full real and what is potential.

Def. The fulfilment of what exists potentially, in so far as it exists potentially, is motion – namely, of what is alterable qua alterable, alteration: of what can be increased and its opposite what can be decreased (there is no common name), increase

and decrease: of what can come to be and can pass away, coming to he and passing away: of what can be carried along, locomotion.

Examples will elucidate this definition of motion. When the buildable, in so far as it is just that, is fully real, it is being built, and this is building. Similarly, learning, doctoring, rolling, leaping, ripening, ageing.

The same thing, if it is of a certain kind, can be both potential and fully real, not indeed at the same time or not in the same respect, but e.g. potentially hot and actually cold. Hence at once such things will act and be acted on by one another in many ways: each of them will be capable at the same time of causing alteration and of being altered. Hence, too, what effects motion as a physical agent can be moved: when a thing of this kind causes motion, it is itself also moved. This, indeed, has led some people to suppose that every mover is moved. But this question depends on another set of arguments, and the truth will be made clear later. is possible for a thing to cause motion, though it is itself incapable of being moved.

It is the fulfilment of what is potential when it is already fully real and operates not as itself but as movable, that is motion. What I mean by 'as' is this: Bronze is potentially a statue. But it is not the fulfilment of bronze as bronze which is motion. For 'to be bronze' and 'to be a certain potentiality' are not the same.

If they were identical without qualification, i.e. in definition, the fulfilment of bronze as bronze would have been motion. But they are not the same, as has been said. (This is obvious in contraries. 'To be capable of health' and 'to be capable of illness' are not the same, for if they were there would be no difference between being ill and being well. Yet the subject both of health and of sickness – whether it is humour or blood – is one and the same.)

We can distinguish, then, between the two – just as, to give another example, ‘colour’ and visible’ are different – and clearly it is the fulfilment of what is potential as potential that is motion. So this, precisely, is motion.

Further it is evident that motion is an attribute of a thing just when it is fully real in this way, and neither before nor after. For each thing of this kind is capable of being at one time actual, at another not. Take for instance the buildable as buildable. The actuality of the buildable as buildable is the process of building. For the actuality of the buildable must be either this or the house. But when there is a house, the buildable is no longer buildable. On the other hand, it is the buildable which is being built. The process then of being built must be the kind of actuality required But building is a kind of motion, and the same account will apply to the other kinds also.

2

The soundness of this definition is evident both when we consider the accounts of motion that the others have given, and also from the difficulty of defining it otherwise.

One could not easily put motion and change in another genus – this is plain if we consider where some people put it; they identify motion with or ‘inequality’ or ‘not being’; but such things are not necessarily moved, whether they are ‘different’ or ‘unequal’ or ‘non-existent’; Nor is change either to or from these rather than to or from their opposites.

The reason why they put motion into these genera is that it is thought to be something indefinite, and the principles in the second column are indefinite because they are privative: none

of them is either 'this' or 'such' or comes under any of the other modes of predication. The reason in turn why motion is thought to be indefinite is that it cannot be classed simply as a potentiality or as an actuality – a thing that is merely capable of having a certain size is not undergoing change, nor yet a thing that is actually of a certain size, and motion is thought to be a sort of actuality, but incomplete, the reason for this view being that the potential whose actuality it is is incomplete. This is why it is hard to grasp what motion is. It is necessary to class it with privation or with potentiality or with sheer actuality, yet none of these seems possible. There remains then the suggested mode of definition, namely that it is a sort of actuality, or actuality of the kind described, hard to grasp, but not incapable of existing.

The mover too is moved, as has been said – every mover, that is, which is capable of motion, and whose immobility is rest – when a thing is subject to motion its immobility is rest. For to act on the movable as such is just to move it. But this it does by contact, so that at the same time it is also acted on. Hence we can define motion as the fulfilment of the movable qua movable, the cause of the attribute being contact with what can move so that the mover is also acted on. The mover or agent will always be the vehicle of a form, either a 'this' or 'such', which, when it acts, will be the source and cause of the change, e.g. the full-formed man begets man from what is potentially man.

3

The solution of the difficulty that is raised about the motion – whether it is in the movable – is plain. It is the fulfilment of this

potentiality, and by the action of that which has the power of causing motion; and the actuality of that which has the power of causing motion is not other than the actuality of the movable, for it must be the fulfilment of both. A thing is capable of causing motion because it can do this, it is a mover because it actually does it. But it is on the movable that it is capable of acting. Hence there is a single actuality of both alike, just as one to two and two to one are the same interval, and the steep ascent and the steep descent are one – for these are one and the same, although they can be described in different ways. So it is with the mover and the moved.

This view has a dialectical difficulty. Perhaps it is necessary that the actuality of the agent and that of the patient should not be the same. The one is 'agency' and the other 'patiency'; and the outcome and completion of the one is an 'action', that of the other a 'passion'. Since then they are both motions, we may ask: in what are they, if they are different? Either (a) both are in what is acted on and moved, or (b) the agency is in the agent and the patiency in the patient. (If we ought to call the latter also 'agency', the word would be used in two senses.)

Now, in alternative (b), the motion will be in the mover, for the same statement will hold of 'mover' and 'moved'. Hence either every mover will be moved, or, though having motion, it will not be moved.

If on the other hand (a) both are in what is moved and acted on – both the agency and the patiency (e.g. both teaching and learning, though they are two, in the learner), then, first, the actuality of each will not be present in each, and, a second absurdity, a thing will have two motions at the same time. How will there be two alterations of quality in one subject towards one definite quality? The thing is impossible: the actualization will be one.

But (some one will say) it is contrary to reason to suppose that there should be one identical actualization of two things which are different in kind. Yet there will be, if teaching and learning are the same, and agency and patiency. To teach will be the same as to learn, and to act the same as to be acted on – the teacher will necessarily be learning everything that he teaches, and the agent will be acted on. One may reply:

(1) It is not absurd that the actualization of one thing should be in another. Teaching is the activity of a person who can teach, yet the operation is performed on some patient – it is not cut adrift from a subject, but is of A on B.

(2) There is nothing to prevent two things having one and the same actualization, provided the actualizations are not described in the same way, but are related as what can act to what is acting.

(3) Nor is it necessary that the teacher should learn, even if to act and to be acted on are one and the same, provided they are not the same in definition (as 'raiment' and 'dress'), but are the same merely in the sense in which the road from Thebes to Athens and the road from Athens to Thebes are the same, as has been explained above. For it is not things which are in a way the same that have all their attributes the same, but only such as have the same definition. But indeed it by no means follows from the fact that teaching is the same as learning, that to learn is the same as to teach, any more than it follows from the fact that there is one distance between two things which are at a distance from each other, that the two vectors AB and BA, are one and the same. To generalize, teaching is not the same as learning, or agency as patiency, in the full sense, though they belong to the same subject, the motion; for the 'actualization of X in Y' and the 'actualization of Y through the action of X' differ in definition.

What then Motion is, has been stated both generally and particularly. It is not difficult to see how each of its types will be defined – alteration is the fulfillment of the alterable qua alterable (or, more scientifically, the fulfilment of what can act and what can be acted on, as such) – generally and again in each particular case, building, healing, &c. A similar definition will apply to each of the other kinds of motion.

4

The science of nature is concerned with spatial magnitudes and motion and time, and each of these at least is necessarily infinite or finite, even if some things dealt with by the science are not, e.g. a quality or a point – it is not necessary perhaps that such things should be put under either head. Hence it is incumbent on the person who specializes in physics to discuss the infinite and to inquire whether there is such a thing or not, and, if there is, what it is.

The appropriateness to the science of this problem is clearly indicated. All who have touched on this kind of science in a way worth considering have formulated views about the infinite, and indeed, to a man, make it a principle of things.

(1) Some, as the Pythagoreans and Plato, make the infinite a principle in the sense of a self-subsistent substance, and not as a mere attribute of some other thing. Only the Pythagoreans place the infinite among the objects of sense (they do not regard number as separable from these), and assert that what is outside the heaven is infinite. Plato, on the other hand, holds that there is no body outside (the Forms are not outside because they are nowhere),yet that the infinite is present not only in the objects of sense but in the Forms also.

Further, the Pythagoreans identify the infinite with the even. For this, they say, when it is cut off and shut in by the odd, provides things with the element of infinity. An indication of this is what happens with numbers. If the gnomons are placed round the one, and without the one, in the one construction the figure that results is always different, in the other it is always the same. But Plato has two infinites, the Great and the Small.

The physicists, on the other hand, all of them, always regard the infinite as an attribute of a substance which is different from it and belongs to the class of the so-called elements – water or air or what is intermediate between them. Those who make them limited in number never make them infinite in amount. But those who make the elements infinite in number, as Anaxagoras and Democritus do, say that the infinite is continuous by contact – compounded of the homogeneous parts according to the one, of the seed-mass of the atomic shapes according to the other.

Further, Anaxagoras held that any part is a mixture in the same way as the All, on the ground of the observed fact that anything comes out of anything. For it is probably for this reason that he maintains that once upon a time all things were together. (This flesh and this bone were together, and so of any thing: therefore all things: and at the same time too.) For there is a beginning of separation, not only for each thing, but for all. Each thing that comes to be comes from a similar body, and there is a coming to be of all things, though not, it is true, at the same time. Hence there must also be an origin of coming to be. One such source there is which he calls Mind, and Mind begins its work of thinking from some starting-point. So necessarily all things must have been together at a certain time, and must have begun to be moved at a certain time.

Democritus, for his part, asserts the contrary, namely that no element arises from another element. Nevertheless for him the common body is a source of all things, differing from part to part in size and in shape.

It is clear then from these considerations that the inquiry concerns the physicist. Nor is it without reason that they all make it a principle or source. We cannot say that the infinite has no effect, and the only effectiveness which we can ascribe to it is that of a principle. Everything is either a source or derived from a source. But there cannot be a source of the infinite or limitless, for that would be a limit of it. Further, as it is a beginning, it is both uncreatable and indestructible. For there must be a point at which what has come to be reaches completion, and also a termination of all passing away. That is why, as we say, there is no principle of this, but it is this which is held to be the principle of other things, and to encompass all and to steer all, as those assert who do not recognize, alongside the infinite, other causes, such as Mind or Friendship. Further they identify it with the Divine, for it is 'deathless and imperishable' as Anaximander says, with the majority of the physicists.

Belief in the existence of the infinite comes mainly from five considerations:

(1) From the nature of time – for it is infinite.

(2) From the division of magnitudes – for the mathematicians also use the notion of the infinite.

(3) If coming to be and passing away do not give out, it is only because that from which things come to be is infinite.

(4) Because the limited always finds its limit in something, so that there must be no limit, if everything is always limited by something different from itself.

(5) Most of all, a reason which is peculiarly appropriate and presents the difficulty that is felt by everybody – not only number but also mathematical magnitudes and what is outside the heaven are supposed to be infinite because they never give out in our thought.

The last fact (that what is outside is infinite) leads people to suppose that body also is infinite, and that there is an infinite number of worlds. Why should there be body in one part of the void rather than in another? Grant only that mass is anywhere and it follows that it must be everywhere. Also, if void and place are infinite, there must be infinite body too, for in the case of eternal things what may be must be. But the problem of the infinite is difficult: many contradictions result whether we suppose it to exist or not to exist. If it exists, we have still to ask how it exists; as a substance or as the essential attribute of some entity? Or in neither way, yet none the less is there something which is infinite or some things which are infinitely many?

The problem, however, which specially belongs to the physicist is to investigate whether there is a sensible magnitude which is infinite.

We must begin by distinguishing the various senses in which the term 'infinite' is used.

(1) What is incapable of being gone through, because it is not in its nature to be gone through (the sense in which the voice is 'invisible').

(2) What admits of being gone through, the process however having no termination, or what scarcely admits of being gone through.

(3) What naturally admits of being gone through, but is not actually gone through or does not actually reach an end.

Further, everything that is infinite may be so in respect of addition or division or both.

5

Now it is impossible that the infinite should be a thing which is itself infinite, separable from sensible objects. If the infinite is neither a magnitude nor an aggregate, but is itself a substance and not an attribute, it will be indivisible; for the divisible must be either a magnitude or an aggregate. But if indivisible, then not infinite, except in the sense (1) in which the voice is 'invisible'. But this is not the sense in which it is used by those who say that the infinite exists, nor that in which we are investigating it, namely as (2) 'that which cannot be gone through'. But if the infinite exists as an attribute, it would not be, qua infinite an element in substances, any more than the invisible would be an element of speech, though the voice is invisible.

Further, how can the infinite be itself any thing, unless both number and magnitude, of which it is an essential attribute, exist in that way? If they are not substances, a fortiori the infinite is not.

It is plain, too, that the infinite cannot be an actual thing and a substance and principle. For any part of it that is taken will be infinite, if it has parts: for 'to be infinite' and 'the infinite' are the same, if it is a substance and not predicated of a subject. Hence it will be either indivisible or divisible into infinites. But the same thing cannot be many infinites. (Yet just as part of air is air, so a part of the infinite would be infinite, if it is supposed to be a substance and principle.) Therefore the infinite must be

without parts and indivisible. But this cannot be true of what is infinite in full completion: for it must be a definite quantity.

Suppose then that infinity belongs to substance as an attribute. But, if so, it cannot, as we have said, be described as a principle, but rather that of which it is an attribute – the air or the even number.

Thus the view of those who speak after the manner of the Pythagoreans is absurd. With the same breath they treat the infinite as substance, and divide it into parts.

This discussion, however, involves the more general question whether the infinite can be present in mathematical objects and things which are intelligible and do not have extension, as well as among sensible objects. Our inquiry (as physicists) is limited to its special subject-matter, the objects of sense, and we have to ask whether there is or is not among them a body which is infinite in the direction of increase.

We may begin with a dialectical argument and show as follows that there is no such thing. If 'bounded by a surface' is the definition of body there cannot be an infinite body either intelligible or sensible. Nor can number taken in abstraction be infinite, for number or that which has number is numerable. If then the numerable can be numbered, it would also be possible to go through the infinite.

If, on the other hand, we investigate the question more in accordance with principles appropriate to physics, we are led as follows to the same result.

The infinite body must be either (1) compound, or (2) simple; yet neither alternative is possible.

(1) Compound the infinite body will not be, if the elements are finite in number. For they must be more than one, and the

contraries must always balance, and no one of them can be infinite. If one of the bodies falls in any degree short of the other in potency – suppose fire is finite in amount while air is infinite and a given quantity of fire exceeds in power the same amount of air in any ratio provided it is numerically definite – the infinite body will obviously prevail over and annihilate the finite body. On the other hand, it is impossible that each should be infinite. 'Body' is what has extension in all directions and the infinite is what is boundlessly extended, so that the infinite body would be extended in all directions ad infinitum.

Nor (2) can the infinite body be one and simple, whether it is, as some hold, a thing over and above the elements (from which they generate the elements) or is not thus qualified.

(a) We must consider the former alternative; for there are some people who make this the infinite, and not air or water, in order that the other elements may not be annihilated by the element which is infinite. They have contrariety with each other – air is cold, water moist, fire hot; if one were infinite, the others by now would have ceased to be. As it is, they say, the infinite is different from them and is their source.

It is impossible, however, that there should be such a body; not because it is infinite on that point a general proof can be given which applies equally to all, air, water, or anything else – but simply because there is, as a matter of fact, no such sensible body, alongside the so-called elements. Everything can be resolved into the elements of which it is composed. Hence the body in question would have been present in our world here, alongside air and fire and earth and water: but nothing of the kind is observed.

(b) Nor can fire or any other of the elements be infinite. For generally, and apart from the question of how any of them could be infinite, the All, even if it were limited, cannot either be

or become one of them, as Heraclitus says that at some time all things become fire. (The same argument applies also to the one which the physicists suppose to exist alongside the elements: for everything changes from contrary to contrary, e.g. from hot to cold).

The preceding consideration of the various cases serves to show us whether it is or is not possible that there should be an infinite sensible body. The following arguments give a general demonstration that it is not possible.

It is the nature of every kind of sensible body to be somewhere, and there is a place appropriate to each, the same for the part and for the whole, e.g. for the whole earth and for a single clod, and for fire and for a spark.

Suppose (a) that the infinite sensible body is homogeneous. Then each part will be either immovable or always being carried along. Yet neither is possible. For why downwards rather than upwards or in any other direction? I mean, e.g, if you take a clod, where will it be moved or where will it be at rest? For ex hypothesi the place of the body akin to it is infinite. Will it occupy the whole place, then? And how? What then will be the nature of its rest and of its movement, or where will they be? It will either be at home everywhere – then it will not be moved; or it will be moved everywhere – then it will not come to rest.

But if (b) the All has dissimilar parts, the proper places of the parts will be dissimilar also, and the body of the All will have no unity except that of contact. Then, further, the parts will be either finite or infinite in variety of kind. (i) Finite they cannot be, for if the All is to be infinite, some of them would have to be infinite, while the others were not, e.g. fire or water will be infinite. But, as we have seen before, such an element would destroy what is contrary to it. (This indeed is the reason why none of the physicists made fire or earth the one infinite body,

but either water or air or what is intermediate between them, because the abode of each of the two was plainly determinate, while the others have an ambiguous place between up and down.)

But (ii) if the parts are infinite in number and simple, their proper places too will be infinite in number, and the same will be true of the elements themselves. If that is impossible, and the places are finite, the whole too must be finite; for the place and the body cannot but fit each other. Neither is the whole place larger than what can be filled by the body (and then the body would no longer be infinite), nor is the body larger than the place; for either there would be an empty space or a body whose nature it is to be nowhere.

Anaxagoras gives an absurd account of why the infinite is at rest. He says that the infinite itself is the cause of its being fixed. This because it is in itself, since nothing else contains it – on the assumption that wherever anything is, it is there by its own nature. But this is not true: a thing could be somewhere by compulsion, and not where it is its nature to be.

Even if it is true as true can be that the whole is not moved (for what is fixed by itself and is in itself must be immovable), yet we must explain why it is not its nature to be moved. It is not enough just to make this statement and then decamp. Anything else might be in a state of rest, but there is no reason why it should not be its nature to be moved. The earth is not carried along, and would not be carried along if it were infinite, provided it is held together by the centre. But it would not be because there was no other region in which it could be carried along that it would remain at the centre, but because this is its nature. Yet in this case also we may say that it fixes itself. If then in the case of the earth, supposed to be infinite, it is at rest, not because it is infinite, but because it has weight and what is

heavy rests at the centre and the earth is at the centre, similarly the infinite also would rest in itself, not because it is infinite and fixes itself, but owing to some other cause.

Another difficulty emerges at the same time. Any part of the infinite body ought to remain at rest. Just as the infinite remains at rest in itself because it fixes itself, so too any part of it you may take will remain in itself. The appropriate places of the whole and of the part are alike, e.g. of the whole earth and of a clod the appropriate place is the lower region; of fire as a whole and of a spark, the upper region. If, therefore, to be in itself is the place of the infinite, that also will be appropriate to the part. Therefore it will remain in itself.

In general, the view that there is an infinite body is plainly incompatible with the doctrine that there is necessarily a proper place for each kind of body, if every sensible body has either weight or lightness, and if a body has a natural locomotion towards the centre if it is heavy, and upwards if it is light. This would need to be true of the infinite also. But neither character can belong to it: it cannot be either as a whole, nor can it be half the one and half the other. For how should you divide it? or how can the infinite have the one part up and the other down, or an extremity and a centre?

Further, every sensible body is in place, and the kinds or differences of place are up-down, before-behind, right-left; and these distinctions hold not only in relation to us and by arbitrary agreement, but also in the whole itself. But in the infinite body they cannot exist. In general, if it is impossible that there should be an infinite place, and if every body is in place, there cannot be an infinite body.

Surely what is in a special place is in place, and what is in place is in a special place. Just, then, as the infinite cannot be quantity – that would imply that it has a particular quantity, e,g, two or

three cubits; quantity just means these – so a thing's being in place means that it is somewhere, and that is either up or down or in some other of the six differences of position: but each of these is a limit.

It is plain from these arguments that there is no body which is actually infinite.

6

But on the other hand to suppose that the infinite does not exist in any way leads obviously to many impossible consequences: there will be a beginning and an end of time, a magnitude will not be divisible into magnitudes, number will not be infinite. If, then, in view of the above considerations, neither alternative seems possible, an arbiter must be called in; and clearly there is a sense in which the infinite exists and another in which it does not.

We must keep in mind that the word 'is' means either what potentially is or what fully is. Further, a thing is infinite either by addition or by division.

Now, as we have seen, magnitude is not actually infinite. But by division it is infinite. (There is no difficulty in refuting the theory of indivisible lines.) The alternative then remains that the infinite has a potential existence.

But the phrase 'potential existence' is ambiguous. When we speak of the potential existence of a statue we mean that there will be an actual statue. It is not so with the infinite. There will not be an actual infinite. The word 'is' has many senses, and we say that the infinite 'is' in the sense in which we say 'it is day' or

‘it is the games’, because one thing after another is always coming into existence. For of these things too the distinction between potential and actual existence holds. We say that there are Olympic games, both in the sense that they may occur and that they are actually occurring.

The infinite exhibits itself in different ways – in time, in the generations of man, and in the division of magnitudes. For generally the infinite has this mode of existence: one thing is always being taken after another, and each thing that is taken is always finite, but always different. Again, ‘being’ has more than one sense, so that we must not regard the infinite as a ‘this’, such as a man or a horse, but must suppose it to exist in the sense in which we speak of the day or the games as existing things whose being has not come to them like that of a substance, but consists in a process of coming to be or passing away; definite if you like at each stage, yet always different.

But when this takes place in spatial magnitudes, what is taken perists, while in the succession of time and of men it takes place by the passing away of these in such a way that the source of supply never gives out.

In a way the infinite by addition is the same thing as the infinite by division. In a finite magnitude, the infinite by addition comes about in a way inverse to that of the other. For in proportion as we see division going on, in the same proportion we see addition being made to what is already marked off. For if we take a determinate part of a finite magnitude and add another part determined by the same ratio (not taking in the same amount of the original whole), and so on, we shall not traverse the given magnitude. But if we increase the ratio of the part, so as always to take in the same amount, we shall traverse the magnitude, for every finite magnitude is exhausted by means of any determinate quantity however small.

The infinite, then, exists in no other way, but in this way it does exist, potentially and by reduction. It exists fully in the sense in which we say ‘it is day’ or ‘it is the games’; and potentially as matter exists, not independently as what is finite does.

By addition then, also, there is potentially an infinite, namely, what we have described as being in a sense the same as the infinite in respect of division. For it will always be possible to take something ah extra. Yet the sum of the parts taken will not exceed every determinate magnitude, just as in the direction of division every determinate magnitude is surpassed in smallness and there will be a smaller part.

But in respect of addition there cannot be an infinite which even potentially exceeds every assignable magnitude, unless it has the attribute of being actually infinite, as the physicists hold to be true of the body which is outside the world, whose essential nature is air or something of the kind. But if there cannot be in this way a sensible body which is infinite in the full sense, evidently there can no more be a body which is potentially infinite in respect of addition, except as the inverse of the infinite by division, as we have said. It is for this reason that Plato also made the infinites two in number, because it is supposed to be possible to exceed all limits and to proceed ad infinitum in the direction both of increase and of reduction. Yet though he makes the infinites two, he does not use them. For in the numbers the infinite in the direction of reduction is not present, as the monad is the smallest; nor is the infinite in the direction of increase, for the parts number only up to the decad.

The infinite turns out to be the contrary of what it is said to be. It is not what has nothing outside it that is infinite, but what always has something outside it. This is indicated by the fact that rings also that have no bezel are described as ‘endless’, because it is always possible to take a part which is outside a

given part. The description depends on a certain similarity, but it is not true in the full sense of the word. This condition alone is not sufficient: it is necessary also that the next part which is taken should never be the same. In the circle, the latter condition is not satisfied: it is only the adjacent part from which the new part is different.

Our definition then is as follows:

A quantity is infinite if it is such that we can always take a part outside what has been already taken. On the other hand, what has nothing outside it is complete and whole. For thus we define the whole – that from which nothing is wanting, as a whole man or a whole box. What is true of each particular is true of the whole as such – the whole is that of which nothing is outside. On the other hand that from which something is absent and outside, however small that may be, is not 'all'. 'Whole' and 'complete' are either quite identical or closely akin. Nothing is complete (teleion) which has no end (telos); and the end is a limit.

Hence Parmenides must be thought to have spoken better than Melissus. The latter says that the whole is infinite, but the former describes it as limited, 'equally balanced from the middle'. For to connect the infinite with the all and the whole is not like joining two pieces of string; for it is from this they get the dignity they ascribe to the infinite – its containing all things and holding the all in itself – from its having a certain similarity to the whole. It is in fact the matter of the completeness which belongs to size, and what is potentially a whole, though not in the full sense. It is divisible both in the direction of reduction and of the inverse addition. It is a whole and limited; not, however, in virtue of its own nature, but in virtue of what is other than it. It does not contain, but, in so far as it is infinite, is contained. Consequently, also, it is unknowable, qua infinite; for

the matter has no form. (Hence it is plain that the infinite stands in the relation of part rather than of whole. For the matter is part of the whole, as the bronze is of the bronze statue.) If it contains in the case of sensible things, in the case of intelligible things the great and the small ought to contain them. But it is absurd and impossible to suppose that the unknowable and indeterminate should contain and determine.

7

It is reasonable that there should not be held to be an infinite in respect of addition such as to surpass every magnitude, but that there should be thought to be such an infinite in the direction of division. For the matter and the infinite are contained inside what contains them, while it is the form which contains. It is natural too to suppose that in number there is a limit in the direction of the minimum, and that in the other direction every assigned number is surpassed. In magnitude, on the contrary, every assigned magnitude is surpassed in the direction of smallness, while in the other direction there is no infinite magnitude. The reason is that what is one is indivisible whatever it may be, e.g. a man is one man, not many. Number on the other hand is a plurality of 'ones' and a certain quantity of them. Hence number must stop at the indivisible: for 'two' and 'three' are merely derivative terms, and so with each of the other numbers. But in the direction of largeness it is always possible to think of a larger number: for the number of times a magnitude can be bisected is infinite. Hence this infinite is potential, never actual: the number of parts that can be taken always surpasses any assigned number. But this number is not separable from the process of bisection, and its infinity is not a

permanent actuality but consists in a process of coming to be, like time and the number of time.

With magnitudes the contrary holds. What is continuous is divided ad infinitum, but there is no infinite in the direction of increase. For the size which it can potentially be, it can also actually be. Hence since no sensible magnitude is infinite, it is impossible to exceed every assigned magnitude; for if it were possible there would be something bigger than the heavens.

The infinite is not the same in magnitude and movement and time, in the sense of a single nature, but its secondary sense depends on its primary sense, i.e. movement is called infinite in virtue of the magnitude covered by the movement (or alteration or growth), and time because of the movement. (I use these terms for the moment. Later I shall explain what each of them means, and also why every magnitude is divisible into magnitudes.)

Our account does not rob the mathematicians of their science, by disproving the actual existence of the infinite in the direction of increase, in the sense of the untraversable. In point of fact they do not need the infinite and do not use it. They postulate only that the finite straight line may be produced as far as they wish. It is possible to have divided in the same ratio as the largest quantity another magnitude of any size you like. Hence, for the purposes of proof, it will make no difference to them to have such an infinite instead, while its existence will be in the sphere of real magnitudes.

In the fourfold scheme of causes, it is plain that the infinite is a cause in the sense of matter, and that its essence is privation, the subject as such being what is continuous and sensible. All the other thinkers, too, evidently treat the infinite as matter – that is why it is inconsistent in them to make it what contains, and not what is contained.

8

It remains to dispose of the arguments which are supposed to support the view that the infinite exists not only potentially but as a separate thing. Some have no cogency; others can be met by fresh objections that are valid.

(1) In order that coming to be should not fail, it is not necessary that there should be a sensible body which is actually infinite. The passing away of one thing may be the coming to be of another, the All being limited.

(2) There is a difference between touching and being limited. The former is relative to something and is the touching of something (for everything that touches touches something), and further is an attribute of some one of the things which are limited. On the other hand, what is limited is not limited in relation to anything. Again, contact is not necessarily possible between any two things taken at random.

(3) To rely on mere thinking is absurd, for then the excess or defect is not in the thing but in the thought. One might think that one of us is bigger than he is and magnify him ad infinitum. But it does not follow that he is bigger than the size we are, just because some one thinks he is, but only because he is the size he is. The thought is an accident.

(a) Time indeed and movement are infinite, and also thinking, in the sense that each part that is taken passes in succession out of existence.

(b) Magnitude is not infinite either in the way of reduction or of magnification in thought.

This concludes my account of the way in which the infinite exists, and of the way in which it does not exist, and of what it is.

Book IV

1

The physicist must have a knowledge of Place, too, as well as of the infinite – namely, whether there is such a thing or not, and the manner of its existence and what it is – both because all suppose that things which exist are somewhere (the non-existent is nowhere – where is the goat-stag or the sphinx?), and because 'motion' in its most general and primary sense is change of place, which we call 'locomotion'.

The question, what is place? presents many difficulties. An examination of all the relevant facts seems to lead to divergent conclusions. Moreover, we have inherited nothing from previous thinkers, whether in the way of a statement of difficulties or of a solution.

The existence of place is held to be obvious from the fact of mutual replacement. Where water now is, there in turn, when the water has gone out as from a vessel, air is present. When therefore another body occupies this same place, the place is thought to be different from all the bodies which come to be in it and replace one another. What now contains air formerly

contained water, so that clearly the place or space into which and out of which they passed was something different from both.

Further, the typical locomotions of the elementary natural bodies – namely, fire, earth, and the like – show not only that place is something, but also that it exerts a certain influence. Each is carried to its own place, if it is not hindered, the one up, the other down. Now these are regions or kinds of place – up and down and the rest of the six directions. Nor do such distinctions (up and down and right and left, &c.) hold only in relation to us. To us they are not always the same but change with the direction in which we are turned: that is why the same thing may be both right and left, up and down, before and behind. But in nature each is distinct, taken apart by itself. It is not every chance direction which is 'up', but where fire and what is light are carried; similarly, too, 'down' is not any chance direction but where what has weight and what is made of earth are carried – the implication being that these places do not differ merely in relative position, but also as possessing distinct potencies. This is made plain also by the objects studied by mathematics. Though they have no real place, they nevertheless, in respect of their position relatively to us, have a right and left as attributes ascribed to them only in consequence of their relative position, not having by nature these various characteristics. Again, the theory that the void exists involves the existence of place: for one would define void as place bereft of body.

These considerations then would lead us to suppose that place is something distinct from bodies, and that every sensible body is in place. Hesiod too might be held to have given a correct account of it when he made chaos first. At least he says:

‘First of all things came chaos to being, then broad-breasted earth,’ implying that things need to have space first, because he thought, with most people, that everything is somewhere and in place. If this is its nature, the potency of place must be a marvellous thing, and take precedence of all other things. For that without which nothing else can exist, while it can exist without the others, must needs be first; for place does not pass out of existence when the things in it are annihilated.

True, but even if we suppose its existence settled, the question of its nature presents difficulty – whether it is some sort of ‘bulk’ of body or some entity other than that, for we must first determine its genus.

(1) Now it has three dimensions, length, breadth, depth, the dimensions by which all body also is bounded. But the place cannot be body; for if it were there would be two bodies in the same place.

(2) Further, if body has a place and space, clearly so too have surface and the other limits of body; for the same statement will apply to them: where the bounding planes of the water were, there in turn will be those of the air. But when we come to a point we cannot make a distinction between it and its place. Hence if the place of a point is not different from the point, no more will that of any of the others be different, and place will not be something different from each of them.

(3) What in the world then are we to suppose place to be? If it has the sort of nature described, it cannot be an element or composed of elements, whether these be corporeal or incorporeal: for while it has size, it has not body. But the elements of sensible bodies are bodies, while nothing that has size results from a combination of intelligible elements.

(4) Also we may ask: of what in things is space the cause? None of the four modes of causation can be ascribed to it. It is neither in the sense of the matter of existents (for nothing is composed of it), nor as the form and definition of things, nor as end, nor does it move existents.

(5) Further, too, if it is itself an existent, where will it be? Zeno's difficulty demands an explanation: for if everything that exists has a place, place too will have a place, and so on ad infinitum.

(6) Again, just as every body is in place, so, too, every place has a body in it. What then shall we say about growing things? It follows from these premisses that their place must grow with them, if their place is neither less nor greater than they are.

By asking these questions, then, we must raise the whole problem about place – not only as to what it is, but even whether there is such a thing.

2

We may distinguish generally between predicating B of A because it (A) is itself, and because it is something else; and particularly between place which is common and in which all bodies are, and the special place occupied primarily by each. I mean, for instance, that you are now in the heavens because you are in the air and it is in the heavens; and you are in the air because you are on the earth; and similarly on the earth because you are in this place which contains no more than you.

Now if place is what primarily contains each body, it would be a limit, so that the place would be the form or shape of each body

by which the magnitude or the matter of the magnitude is defined: for this is the limit of each body.

If, then, we look at the question in this way the place of a thing is its form. But, if we regard the place as the extension of the magnitude, it is the matter. For this is different from the magnitude: it is what is contained and defined by the form, as by a bounding plane. Matter or the indeterminate is of this nature; when the boundary and attributes of a sphere are taken away, nothing but the matter is left.

This is why Plato in the Timaeus says that matter and space are the same; for the 'participant' and space are identical. (It is true, indeed, that the account he gives there of the 'participant' is different from what he says in his so-called 'unwritten teaching'. Nevertheless, he did identify place and space.) I mention Plato because, while all hold place to be something, he alone tried to say what it is.

In view of these facts we should naturally expect to find difficulty in determining what place is, if indeed it is one of these two things, matter or form. They demand a very close scrutiny, especially as it is not easy to recognize them apart.

But it is at any rate not difficult to see that place cannot be either of them. The form and the matter are not separate from the thing, whereas the place can be separated. As we pointed out, where air was, water in turn comes to be, the one replacing the other; and similarly with other bodies. Hence the place of a thing is neither a part nor a state of it, but is separable from it. For place is supposed to be something like a vessel – the vessel being a transportable place. But the vessel is no part of the thing.

In so far then as it is separable from the thing, it is not the form: qua containing, it is different from the matter.

Also it is held that what is anywhere is both itself something and that there is a different thing outside it. (Plato of course, if we may digress, ought to tell us why the form and the numbers are not in place, if 'what participates' is place – whether what participates is the Great and the Small or the matter, as he called it in writing in the Timaeus.)

Further, how could a body be carried to its own place, if place was the matter or the form? It is impossible that what has no reference to motion or the distinction of up and down can be place. So place must be looked for among things which have these characteristics.

If the place is in the thing (it must be if it is either shape or matter) place will have a place: for both the form and the indeterminate undergo change and motion along with the thing, and are not always in the same place, but are where the thing is. Hence the place will have a place.

Further, when water is produced from air, the place has been destroyed, for the resulting body is not in the same place. What sort of destruction then is that?

This concludes my statement of the reasons why space must be something, and again of the difficulties that may be raised about its essential nature.

3

The next step we must take is to see in how many senses one thing is said to be 'in' another.

(1) As the finger is 'in' the hand and generally the part 'in' the whole.

(2) As the whole is ‘in’ the parts: for there is no whole over and above the parts.

(3) As man is ‘in’ animal and generally species ‘in’ genus.

(4) As the genus is ‘in’ the species and generally the part of the specific form ‘in’ the definition of the specific form.

(5) As health is ‘in’ the hot and the cold and generally the form ‘in’ the matter.

(6) As the affairs of Greece centre ‘in’ the king, and generally events centre ‘in’ their primary motive agent.

(7) As the existence of a thing centres ‘in its good and generally ‘in’ its end, i.e. in ‘that for the sake of which’ it exists.

(8) In the strictest sense of all, as a thing is ‘in’ a vessel, and generally ‘in’ place.

One might raise the question whether a thing can be in itself, or whether nothing can be in itself – everything being either nowhere or in something else.

The question is ambiguous; we may mean the thing qua itself or qua something else.

When there are parts of a whole – the one that in which a thing is, the other the thing which is in it – the whole will be described as being in itself. For a thing is described in terms of its parts, as well as in terms of the thing as a whole, e.g. a man is said to be white because the visible surface of him is white, or to be scientific because his thinking faculty has been trained. The jar then will not be in itself and the wine will not be in itself. But the jar of wine will: for the contents and the container are both parts of the same whole.

In this sense then, but not primarily, a thing can be in itself, namely, as ‘white’ is in body (for the visible surface is in body), and science is in the mind.

It is from these, which are ‘parts’ (in the sense at least of being ‘in’ the man), that the man is called white, &c. But the jar and the wine in separation are not parts of a whole, though together they are. So when there are parts, a thing will be in itself, as ‘white’ is in man because it is in body, and in body because it resides in the visible surface. We cannot go further and say that it is in surface in virtue of something other than itself. (Yet it is not in itself: though these are in a way the same thing,) they differ in essence, each having a special nature and capacity, ‘surface’ and ‘white’.

Thus if we look at the matter inductively we do not find anything to be ‘in’ itself in any of the senses that have been distinguished; and it can be seen by argument that it is impossible. For each of two things will have to be both, e.g. the jar will have to be both vessel and wine, and the wine both wine and jar, if it is possible for a thing to be in itself; so that, however true it might be that they were in each other, the jar will receive the wine in virtue not of its being wine but of the wine’s being wine, and the wine will be in the jar in virtue not of its being a jar but of the jar’s being a jar. Now that they are different in respect of their essence is evident; for ‘that in which something is’ and ‘that which is in it’ would be differently defined.

Nor is it possible for a thing to be in itself even incidentally: for two things would at the same time in the same thing. The jar would be in itself – if a thing whose nature it is to receive can be in itself; and that which it receives, namely (if wine) wine, will be in it.

Obviously then a thing cannot be in itself primarily.

Zeno's problem – that if Place is something it must be in something – is not difficult to solve. There is nothing to prevent the first place from being 'in' something else – not indeed in that as 'in' place, but as health is 'in' the hot as a positive determination of it or as the hot is 'in' body as an affection. So we escape the infinite regress.

Another thing is plain: since the vessel is no part of what is in it (what contains in the strict sense is different from what is contained), place could not be either the matter or the form of the thing contained, but must different – for the latter, both the matter and the shape, are parts of what is contained.

This then may serve as a critical statement of the difficulties involved.

4

What then after all is place? The answer to this question may be elucidated as follows.

Let us take for granted about it the various characteristics which are supposed correctly to belong to it essentially. We assume then –

(1) Place is what contains that of which it is the place.

(2) Place is no part of the thing.

(3) The immediate place of a thing is neither less nor greater than the thing.

(4) Place can be left behind by the thing and is separable. In addition:

(5) All place admits of the distinction of up and down, and each of the bodies is naturally carried to its appropriate place and rests there, and this makes the place either up or down.

Having laid these foundations, we must complete the theory. We ought to try to make our investigation such as will render an account of place, and will not only solve the difficulties connected with it, but will also show that the attributes supposed to belong to it do really belong to it, and further will make clear the cause of the trouble and of the difficulties about it. Such is the most satisfactory kind of exposition.

First then we must understand that place would not have been thought of, if there had not been a special kind of motion, namely that with respect to place. It is chiefly for this reason that we suppose the heaven also to be in place, because it is in constant movement. Of this kind of change there are two species – locomotion on the one hand and, on the other, increase and diminution. For these too involve variation of place: what was then in this place has now in turn changed to what is larger or smaller.

Again, when we say a thing is ‘moved’, the predicate either (1) belongs to it actually, in virtue of its own nature, or (2) in virtue of something conjoined with it. In the latter case it may be either (a) something which by its own nature is capable of being moved, e.g. the parts of the body or the nail in the ship, or (b) something which is not in itself capable of being moved, but is always moved through its conjunction with something else, as ‘whiteness’ or ‘science’. These have changed their place only because the subjects to which they belong do so.

We say that a thing is in the world, in the sense of in place, because it is in the air, and the air is in the world; and when we say it is in the air, we do not mean it is in every part of the air, but that it is in the air because of the outer surface of the air

which surrounds it; for if all the air were its place, the place of a thing would not be equal to the thing – which it is supposed to be, and which the primary place in which a thing is actually is.

When what surrounds, then, is not separate from the thing, but is in continuity with it, the thing is said to be in what surrounds it, not in the sense of in place, but as a part in a whole. But when the thing is separate and in contact, it is immediately 'in' the inner surface of the surrounding body, and this surface is neither a part of what is in it nor yet greater than its extension, but equal to it; for the extremities of things which touch are coincident.

Further, if one body is in continuity with another, it is not moved in that but with that. On the other hand it is moved in that if it is separate. It makes no difference whether what contains is moved or not.

Again, when it is not separate it is described as a part in a whole, as the pupil in the eye or the hand in the body: when it is separate, as the water in the cask or the wine in the jar. For the hand is moved with the body and the water in the cask.

It will now be plain from these considerations what place is. There are just four things of which place must be one – the shape, or the matter, or some sort of extension between the bounding surfaces of the containing body, or this boundary itself if it contains no extension over and above the bulk of the body which comes to be in it.

Three of these it obviously cannot be:

(1) The shape is supposed to be place because it surrounds, for the extremities of what contains and of what is contained are coincident. Both the shape and the place, it is true, are boundaries. But not of the same thing: the form is the boundary

of the thing, the place is the boundary of the body which contains it.

(2) The extension between the extremities is thought to be something, because what is contained and separate may often be changed while the container remains the same (as water may be poured from a vessel) – the assumption being that the extension is something over and above the body displaced. But there is no such extension. One of the bodies which change places and are naturally capable of being in contact with the container falls in whichever it may chance to be.

If there were an extension which were such as to exist independently and be permanent, there would be an infinity of places in the same thing. For when the water and the air change places, all the portions of the two together will play the same part in the whole which was previously played by all the water in the vessel; at the same time the place too will be undergoing change; so that there will be another place which is the place of the place, and many places will be coincident. There is not a different place of the part, in which it is moved, when the whole vessel changes its place: it is always the same: for it is in the (proximate) place where they are that the air and the water (or the parts of the water) succeed each other, not in that place in which they come to be, which is part of the place which is the place of the whole world.

(3) The matter, too, might seem to be place, at least if we consider it in what is at rest and is thus separate but in continuity. For just as in change of quality there is something which was formerly black and is now white, or formerly soft and now hard – this is just why we say that the matter exists – so place, because it presents a similar phenomenon, is thought to exist – only in the one case we say so because what was air is now water, in the other because where air formerly was there a

is now water. But the matter, as we said before, is neither separable from the thing nor contains it, whereas place has both characteristics.

Well, then, if place is none of the three – neither the form nor the matter nor an extension which is always there, different from, and over and above, the extension of the thing which is displaced – place necessarily is the one of the four which is left, namely, the boundary of the containing body at which it is in contact with the contained body. (By the contained body is meant what can be moved by way of locomotion.)

Place is thought to be something important and hard to grasp, both because the matter and the shape present themselves along with it, and because the displacement of the body that is moved takes place in a stationary container, for it seems possible that there should be an interval which is other than the bodies which are moved. The air, too, which is thought to be incorporeal, contributes something to the belief: it is not only the boundaries of the vessel which seem to be place, but also what is between them, regarded as empty. Just, in fact, as the vessel is transportable place, so place is a non-portable vessel. So when what is within a thing which is moved, is moved and changes its place, as a boat on a river, what contains plays the part of a vessel rather than that of place. Place on the other hand is rather what is motionless: so it is rather the whole river that is place, because as a whole it is motionless.

Hence we conclude that the innermost motionless boundary of what contains is place.

This explains why the middle of the heaven and the surface which faces us of the rotating system are held to be 'up' and 'down' in the strict and fullest sense for all men: for the one is always at rest, while the inner side of the rotating body remains always coincident with itself. Hence since the light is what is

naturally carried up, and the heavy what is carried down, the boundary which contains in the direction of the middle of the universe, and the middle itself, are down, and that which contains in the direction of the outermost part of the universe, and the outermost part itself, are up.

For this reason, too, place is thought to be a kind of surface, and as it were a vessel, i.e. a container of the thing.

Further, place is coincident with the thing, for boundaries are coincident with the bounded.

5

If then a body has another body outside it and containing it, it is in place, and if not, not. That is why, even if there were to be water which had not a container, the parts of it, on the one hand, will be moved (for one part is contained in another), while, on the other hand, the whole will be moved in one sense, but not in another. For as a whole it does not simultaneously change its place, though it will be moved in a circle: for this place is the place of its parts. (Some things are moved, not up and down, but in a circle; others up and down, such things namely as admit of condensation and rarefaction.)

As was explained, some things are potentially in place, others actually. So, when you have a homogeneous substance which is continuous, the parts are potentially in place: when the parts are separated, but in contact, like a heap, they are actually in place.

Again, (1) some things are per se in place, namely every body which is movable either by way of locomotion or by way of

increase is per se somewhere, but the heaven, as has been said, is not anywhere as a whole, nor in any place, if at least, as we must suppose, no body contains it. On the line on which it is moved, its parts have place: for each is contiguous the next.

But (2) other things are in place indirectly, through something conjoined with them, as the soul and the heaven. The latter is, in a way, in place, for all its parts are: for on the orb one part contains another. That is why the upper part is moved in a circle, while the All is not anywhere. For what is somewhere is itself something, and there must be alongside it some other thing wherein it is and which contains it. But alongside the All or the Whole there is nothing outside the All, and for this reason all things are in the heaven; for the heaven, we may say, is the All. Yet their place is not the same as the heaven. It is part of it, the innermost part of it, which is in contact with the movable body; and for this reason the earth is in water, and this in the air, and the air in the aether, and the aether in heaven, but we cannot go on and say that the heaven is in anything else.

It is clear, too, from these considerations that all the problems which were raised about place will be solved when it is explained in this way:

(1) There is no necessity that the place should grow with the body in it,

(2) Nor that a point should have a place,

(3) Nor that two bodies should be in the same place,

(4) Nor that place should be a corporeal interval: for what is between the boundaries of the place is any body which may chance to be there, not an interval in body.

Further, (5) place is also somewhere, not in the sense of being in a place, but as the limit is in the limited; for not everything that is is in place, but only movable body.

Also (6) it is reasonable that each kind of body should be carried to its own place. For a body which is next in the series and in contact (not by compulsion) is akin, and bodies which are united do not affect each other, while those which are in contact interact on each other.

Nor (7) is it without reason that each should remain naturally in its proper place. For this part has the same relation to its place, as a separable part to its whole, as when one moves a part of water or air: so, too, air is related to water, for the one is like matter, the other form – water is the matter of air, air as it were the actuality of water, for water is potentially air, while air is potentially water, though in another way.

These distinctions will be drawn more carefully later. On the present occasion it was necessary to refer to them: what has now been stated obscurely will then be made more clear. If the matter and the fulfilment are the same thing (for water is both, the one potentially, the other completely), water will be related to air in a way as part to whole. That is why these have contact: it is organic union when both become actually one.

This concludes my account of place – both of its existence and of its nature.

6

The investigation of similar questions about the void, also, must be held to belong to the physicist – namely whether it exists or

not, and how it exists or what it is – just as about place. The views taken of it involve arguments both for and against, in much the same sort of way. For those who hold that the void exists regard it as a sort of place or vessel which is supposed to be 'full' when it holds the bulk which it is capable of containing, 'void' when it is deprived of that – as if 'void' and 'full' and 'place' denoted the same thing, though the essence of the three is different.

We must begin the inquiry by putting down the account given by those who say that it exists, then the account of those who say that it does not exist, and third the current view on these questions.

Those who try to show that the void does not exist do not disprove what people really mean by it, but only their erroneous way of speaking; this is true of Anaxagoras and of those who refute the existence of the void in this way. They merely give an ingenious demonstration that air is something – by straining wine-skins and showing the resistance of the air, and by cutting it off in clepsydras. But people really mean that there is an empty interval in which there is no sensible body. They hold that everything which is in body is body and say that what has nothing in it at all is void (so what is full of air is void). It is not then the existence of air that needs to be proved, but the non-existence of an interval, different from the bodies, either separable or actual – an interval which divides the whole body so as to break its continuity, as Democritus and Leucippus hold, and many other physicists – or even perhaps as something which is outside the whole body, which remains continuous.

These people, then, have not reached even the threshold of the problem, but rather those who say that the void exists.

(1) They argue, for one thing, that change in place (i.e. locomotion and increase) would not be. For it is maintained that

motion would seem not to exist, if there were no void, since what is full cannot contain anything more. If it could, and there were two bodies in the same place, it would also be true that any number of bodies could be together; for it is impossible to draw a line of division beyond which the statement would become untrue. If this were possible, it would follow also that the smallest body would contain the greatest; for 'many a little makes a mickle': thus if many equal bodies can be together, so also can many unequal bodies.

Melissus, indeed, infers from these considerations that the All is immovable; for if it were moved there must, he says, be void, but void is not among the things that exist.

This argument, then, is one way in which they show that there is a void.

(2) They reason from the fact that some things are observed to contract and be compressed, as people say that a cask will hold the wine which formerly filled it, along with the skins into which the wine has been decanted, which implies that the compressed body contracts into the voids present in it.

Again (3) increase, too, is thought to take always by means of void, for nutriment is body, and it is impossible for two bodies to be together. A proof of this they find also in what happens to ashes, which absorb as much water as the empty vessel.

The Pythagoreans, too, (4) held that void exists and that it enters the heaven itself, which as it were inhales it, from the infinite air. Further it is the void which distinguishes the natures of things, as if it were like what separates and distinguishes the terms of a series. This holds primarily in the numbers, for the void distinguishes their nature.

These, then, and so many, are the main grounds on which people have argued for and against the existence of the void.

7

As a step towards settling which view is true, we must determine the meaning of the name.

The void is thought to be place with nothing in it. The reason for this is that people take what exists to be body, and hold that while every body is in place, void is place in which there is no body, so that where there is no body, there must be void.

Every body, again, they suppose to be tangible; and of this nature is whatever has weight or lightness.

Hence, by a syllogism, what has nothing heavy or light in it, is void.

This result, then, as I have said, is reached by syllogism. It would be absurd to suppose that the point is void; for the void must be place which has in it an interval in tangible body.

But at all events we observe then that in one way the void is described as what is not full of body perceptible to touch; and what has heaviness and lightness is perceptible to touch. So we would raise the question: what would they say of an interval that has colour or sound – is it void or not? Clearly they would reply that if it could receive what is tangible it was void, and if not, not.

In another way void is that in which there is no 'this' or corporeal substance. So some say that the void is the matter of the body (they identify the place, too, with this), and in this they speak incorrectly; for the matter is not separable from the things, but they are inquiring about the void as about something separable.

Since we have determined the nature of place, and void must, if it exists, be place deprived of body, and we have stated both in what sense place exists and in what sense it does not, it is plain that on this showing void does not exist, either unseparated or separated; the void is meant to be, not body but rather an interval in body. This is why the void is thought to be something, viz. because place is, and for the same reasons. For the fact of motion in respect of place comes to the aid both of those who maintain that place is something over and above the bodies that come to occupy it, and of those who maintain that the void is something. They state that the void is the condition of movement in the sense of that in which movement takes place; and this would be the kind of thing that some say place is.

But there is no necessity for there being a void if there is movement. It is not in the least needed as a condition of movement in general, for a reason which, incidentally, escaped Melissus; viz. that the full can suffer qualitative change.

But not even movement in respect of place involves a void; for bodies may simultaneously make room for one another, though there is no interval separate and apart from the bodies that are in movement. And this is plain even in the rotation of continuous things, as in that of liquids.

And things can also be compressed not into a void but because they squeeze out what is contained in them (as, for instance, when water is compressed the air within it is squeezed out); and things can increase in size not only by the entrance of something but also by qualitative change; e.g. if water were to be transformed into air.

In general, both the argument about increase of size and that about water poured on to the ashes get in their own way. For either not any and every part of the body is increased, or bodies

may be increased otherwise than by the addition of body, or there may be two bodies in the same place (in which case they are claiming to solve a quite general difficulty, but are not proving the existence of void), or the whole body must be void, if it is increased in every part and is increased by means of void. The same argument applies to the ashes.

It is evident, then, that it is easy to refute the arguments by which they prove the existence of the void.

8

Let us explain again that there is no void existing separately, as some maintain. If each of the simple bodies has a natural locomotion, e.g. fire upward and earth downward and towards the middle of the universe, it is clear that it cannot be the void that is the condition of locomotion. What, then, will the void be the condition of? It is thought to be the condition of movement in respect of place, and it is not the condition of this.

Again, if void is a sort of place deprived of body, when there is a void where will a body placed in it move to? It certainly cannot move into the whole of the void. The same argument applies as against those who think that place is something separate, into which things are carried; viz. how will what is placed in it move, or rest? Much the same argument will apply to the void as to the 'up' and 'down' in place, as is natural enough since those who maintain the existence of the void make it a place.

And in what way will things be present either in place – or in the void? For the expected result does not take place when a body is placed as a whole in a place conceived of as separate and permanent; for a part of it, unless it be placed apart, will

not be in a place but in the whole. Further, if separate place does not exist, neither will void.

If people say that the void must exist, as being necessary if there is to be movement, what rather turns out to be the case, if one the matter, is the opposite, that not a single thing can be moved if there is a void; for as with those who for a like reason say the earth is at rest, so, too, in the void things must be at rest; for there is no place to which things can move more or less than to another; since the void in so far as it is void admits no difference.

The second reason is this: all movement is either compulsory or according to nature, and if there is compulsory movement there must also be natural (for compulsory movement is contrary to nature, and movement contrary to nature is posterior to that according to nature, so that if each of the natural bodies has not a natural movement, none of the other movements can exist); but how can there be natural movement if there is no difference throughout the void or the infinite? For in so far as it is infinite, there will be no up or down or middle, and in so far as it is a void, up differs no whit from down; for as there is no difference in what is nothing, there is none in the void (for the void seems to be a non-existent and a privation of being), but natural locomotion seems to be differentiated, so that the things that exist by nature must be differentiated. Either, then, nothing has a natural locomotion, or else there is no void.

Further, in point of fact things that are thrown move though that which gave them their impulse is not touching them, either by reason of mutual replacement, as some maintain, or because the air that has been pushed pushes them with a movement quicker than the natural locomotion of the projectile wherewith it moves to its proper place. But in a void none of these things

can take place, nor can anything be moved save as that which is carried is moved.

Further, no one could say why a thing once set in motion should stop anywhere; for why should it stop here rather than here? So that a thing will either be at rest or must be moved ad infinitum, unless something more powerful get in its way.

Further, things are now thought to move into the void because it yields; but in a void this quality is present equally everywhere, so that things should move in all directions.

Further, the truth of what we assert is plain from the following considerations. We see the same weight or body moving faster than another for two reasons, either because there is a difference in what it moves through, as between water, air, and earth, or because, other things being equal, the moving body differs from the other owing to excess of weight or of lightness.

Now the medium causes a difference because it impedes the moving thing, most of all if it is moving in the opposite direction, but in a secondary degree even if it is at rest; and especially a medium that is not easily divided, i.e. a medium that is somewhat dense. A, then, will move through B in time G, and through D, which is thinner, in time E (if the length of B is egual to D), in proportion to the density of the hindering body. For let B be water and D air; then by so much as air is thinner and more incorporeal than water, A will move through D faster than through B. Let the speed have the same ratio to the speed, then, that air has to water. Then if air is twice as thin, the body will traverse B in twice the time that it does D, and the time G will be twice the time E. And always, by so much as the medium is more incorporeal and less resistant and more easily divided, the faster will be the movement.

Now there is no ratio in which the void is exceeded by body, as there is no ratio of 0 to a number. For if 4 exceeds 3 by 1, and 2 by more than 1, and 1 by still more than it exceeds 2, still there is no ratio by which it exceeds 0; for that which exceeds must be divisible into the excess + that which is exceeded, so that will be what it exceeds 0 by + 0. For this reason, too, a line does not exceed a point unless it is composed of points! Similarly the void can bear no ratio to the full, and therefore neither can movement through the one to movement through the other, but if a thing moves through the thickest medium such and such a distance in such and such a time, it moves through the void with a speed beyond any ratio. For let Z be void, equal in magnitude to B and to D. Then if A is to traverse and move through it in a certain time, H, a time less than E, however, the void will bear this ratio to the full. But in a time equal to H, A will traverse the part O of A. And it will surely also traverse in that time any substance Z which exceeds air in thickness in the ratio which the time E bears to the time H. For if the body Z be as much thinner than D as E exceeds H, A, if it moves through Z, will traverse it in a time inverse to the speed of the movement, i.e. in a time equal to H. If, then, there is no body in Z, A will traverse Z still more quickly. But we supposed that its traverse of Z when Z was void occupied the time H. So that it will traverse Z in an equal time whether Z be full or void. But this is impossible. It is plain, then, that if there is a time in which it will move through any part of the void, this impossible result will follow: it will be found to traverse a certain distance, whether this be full or void, in an equal time; for there will be some body which is in the same ratio to the other body as the time is to the time.

To sum the matter up, the cause of this result is obvious, viz. that between any two movements there is a ratio (for they occupy time, and there is a ratio between any two times, so long as both are finite), but there is no ratio of void to full.

These are the consequences that result from a difference in the media; the following depend upon an excess of one moving body over another. We see that bodies which have a greater impulse either of weight or of lightness, if they are alike in other respects, move faster over an equal space, and in the ratio which their magnitudes bear to each other. Therefore they will also move through the void with this ratio of speed. But that is impossible; for why should one move faster? (In moving through plena it must be so; for the greater divides them faster by its force. For a moving thing cleaves the medium either by its shape, or by the impulse which the body that is carried along or is projected possesses.) Therefore all will possess equal velocity. But this is impossible.

It is evident from what has been said, then, that, if there is a void, a result follows which is the very opposite of the reason for which those who believe in a void set it up. They think that if movement in respect of place is to exist, the void cannot exist, separated all by itself; but this is the same as to say that place is a separate cavity; and this has already been stated to be impossible.

But even if we consider it on its own merits the so-called vacuum will be found to be really vacuous. For as, if one puts a cube in water, an amount of water equal to the cube will be displaced; so too in air; but the effect is imperceptible to sense. And indeed always in the case of any body that can be displaced, must, if it is not compressed, be displaced in the direction in which it is its nature to be displaced – always either down, if its locomotion is downwards as in the case of earth, or up, if it is fire, or in both directions – whatever be the nature of the inserted body. Now in the void this is impossible; for it is not body; the void must have penetrated the cube to a distance equal to that which this portion of void formerly occupied in

the void, just as if the water or air had not been displaced by the wooden cube, but had penetrated right through it.

But the cube also has a magnitude equal to that occupied by the void; a magnitude which, if it is also hot or cold, or heavy or light, is none the less different in essence from all its attributes, even if it is not separable from them; I mean the volume of the wooden cube. So that even if it were separated from everything else and were neither heavy nor light, it will occupy an equal amount of void, and fill the same place, as the part of place or of the void equal to itself. How then will the body of the cube differ from the void or place that is equal to it? And if there can be two such things, why cannot there be any number coinciding?

This, then, is one absurd and impossible implication of the theory. It is also evident that the cube will have this same volume even if it is displaced, which is an attribute possessed by all other bodies also. Therefore if this differs in no respect from its place, why need we assume a place for bodies over and above the volume of each, if their volume be conceived of as free from attributes? It contributes nothing to the situation if there is an equal interval attached to it as well. [Further it ought to be clear by the study of moving things what sort of thing void is. But in fact it is found nowhere in the world. For air is something, though it does not seem to be so – nor, for that matter, would water, if fishes were made of iron; for the discrimination of the tangible is by touch.]

It is clear, then, from these considerations that there is no separate void.

9

There are some who think that the existence of rarity and density shows that there is a void. If rarity and density do not exist, they say, neither can things contract and be compressed. But if this were not to take place, either there would be no movement at all, or the universe would bulge, as Xuthus said, or air and water must always change into equal amounts (e.g. if air has been made out of a cupful of water, at the same time out of an equal amount of air a cupful of water must have been made), or void must necessarily exist; for compression and expansion cannot take place otherwise.

Now, if they mean by the rare that which has many voids existing separately, it is plain that if void cannot exist separate any more than a place can exist with an extension all to itself, neither can the rare exist in this sense. But if they mean that there is void, not separately existent, but still present in the rare, this is less impossible, yet, first, the void turns out not to be a condition of all movement, but only of movement upwards (for the rare is light, which is the reason why they say fire is rare); second, the void turns out to be a condition of movement not as that in which it takes place, but in that the void carries things up as skins by being carried up themselves carry up what is continuous with them. Yet how can void have a local movement or a place? For thus that into which void moves is till then void of a void.

Again, how will they explain, in the case of what is heavy, its movement downwards? And it is plain that if the rarer and more void a thing is the quicker it will move upwards, if it were completely void it would move with a maximum speed! But perhaps even this is impossible, that it should move at all; the same reason which showed that in the void all things are

incapable of moving shows that the void cannot move, viz. the fact that the speeds are incomparable.

Since we deny that a void exists, but for the rest the problem has been truly stated, that either there will be no movement, if there is not to be condensation and rarefaction, or the universe will bulge, or a transformation of water into air will always be balanced by an equal transformation of air into water (for it is clear that the air produced from water is bulkier than the water): it is necessary therefore, if compression does not exist, either that the next portion will be pushed outwards and make the outermost part bulge, or that somewhere else there must be an equal amount of water produced out of air, so that the entire bulk of the whole may be equal, or that nothing moves. For when anything is displaced this will always happen, unless it comes round in a circle; but locomotion is not always circular, but sometimes in a straight line.

These then are the reasons for which they might say that there is a void; our statement is based on the assumption that there is a single matter for contraries, hot and cold and the other natural contrarieties, and that what exists actually is produced from a potential existent, and that matter is not separable from the contraries but its being is different, and that a single matter may serve for colour and heat and cold.

The same matter also serves for both a large and a small body. This is evident; for when air is produced from water, the same matter has become something different, not by acquiring an addition to it, but has become actually what it was potentially, and, again, water is produced from air in the same way, the change being sometimes from smallness to greatness, and sometimes from greatness to smallness. Similarly, therefore, if air which is large in extent comes to have a smaller volume, or

becomes greater from being smaller, it is the matter which is potentially both that comes to be each of the two.

For as the same matter becomes hot from being cold, and cold from being hot, because it was potentially both, so too from hot it can become more hot, though nothing in the matter has become hot that was not hot when the thing was less hot; just as, if the arc or curve of a greater circle becomes that of a smaller, whether it remains the same or becomes a different curve, convexity has not come to exist in anything that was not convex but straight (for differences of degree do not depend on an intermission of the quality); nor can we get any portion of a flame, in which both heat and whiteness are not present. So too, then, is the earlier heat related to the later. So that the greatness and smallness, also, of the sensible volume are extended, not by the matter's acquiring anything new, but because the matter is potentially matter for both states; so that the same thing is dense and rare, and the two qualities have one matter.

The dense is heavy, and the rare is light. [Again, as the arc of a circle when contracted into a smaller space does not acquire a new part which is convex, but what was there has been contracted; and as any part of fire that one takes will be hot; so, too, it is all a question of contraction and expansion of the same matter.] There are two types in each case, both in the dense and in the rare; for both the heavy and the hard are thought to be dense, and contrariwise both the light and the soft are rare; and weight and hardness fail to coincide in the case of lead and iron.

From what has been said it is evident, then, that void does not exist either separate (either absolutely separate or as a separate element in the rare) or potentially, unless one is willing to call the condition of movement void, whatever it may be. At that

rate the matter of the heavy and the light, qua matter of them, would be the void; for the dense and the rare are productive of locomotion in virtue of this contrariety, and in virtue of their hardness and softness productive of passivity and impassivity, i.e. not of locomotion but rather of qualitative change.

So much, then, for the discussion of the void, and of the sense in which it exists and the sense in which it does not exist.

10

Next for discussion after the subjects mentioned is Time. The best plan will be to begin by working out the difficulties connected with it, making use of the current arguments. First, does it belong to the class of things that exist or to that of things that do not exist? Then secondly, what is its nature? To start, then: the following considerations would make one suspect that it either does not exist at all or barely, and in an obscure way. One part of it has been and is not, while the other is going to be and is not yet. Yet time – both infinite time and any time you like to take – is made up of these. One would naturally suppose that what is made up of things which do not exist could have no share in reality.

Further, if a divisible thing is to exist, it is necessary that, when it exists, all or some of its parts must exist. But of time some parts have been, while others have to be, and no part of it is though it is divisible. For what is 'now' is not a part: a part is a measure of the whole, which must be made up of parts. Time, on the other hand, is not held to be made up of 'nows'.

Again, the ‘now’ which seems to bound the past and the future – does it always remain one and the same or is it always other and other? It is hard to say.

(1) If it is always different and different, and if none of the parts in time which are other and other are simultaneous (unless the one contains and the other is contained, as the shorter time is by the longer), and if the ‘now’ which is not, but formerly was, must have ceased-to-be at some time, the ‘nows’ too cannot be simultaneous with one another, but the prior ‘now’ must always have ceased-to-be. But the prior ‘now’ cannot have ceased-to-be in itself (since it then existed); yet it cannot have ceased-to-be in another ‘now’. For we may lay it down that one ‘now’ cannot be next to another, any more than point to point. If then it did not cease-to-be in the next ‘now’ but in another, it would exist simultaneously with the innumerable ‘nows’ between the two – which is impossible.

Yes, but (2) neither is it possible for the ‘now’ to remain always the same. No determinate divisible thing has a single termination, whether it is continuously extended in one or in more than one dimension: but the ‘now’ is a termination, and it is possible to cut off a determinate time. Further, if coincidence in time (i.e. being neither prior nor posterior) means to be ‘in one and the same «now»’, then, if both what is before and what is after are in this same ‘now’, things which happened ten thousand years ago would be simultaneous with what has happened to-day, and nothing would be before or after anything else.

This may serve as a statement of the difficulties about the attributes of time.

As to what time is or what is its nature, the traditional accounts give us as little light as the preliminary problems which we have worked through.

Some assert that it is (1) the movement of the whole, others that it is (2) the sphere itself.

(1) Yet part, too, of the revolution is a time, but it certainly is not a revolution: for what is taken is part of a revolution, not a revolution. Besides, if there were more heavens than one, the movement of any of them equally would be time, so that there would be many times at the same time.

(2) Those who said that time is the sphere of the whole thought so, no doubt, on the ground that all things are in time and all things are in the sphere of the whole. The view is too naive for it to be worth while to consider the impossibilities implied in it.

But as time is most usually supposed to be (3) motion and a kind of change, we must consider this view.

Now (a) the change or movement of each thing is only in the thing which changes or where the thing itself which moves or changes may chance to be. But time is present equally everywhere and with all things.

Again, (b) change is always faster or slower, whereas time is not: for 'fast' and 'slow' are defined by time – 'fast' is what moves much in a short time, 'slow' what moves little in a long time; but time is not defined by time, by being either a certain amount or a certain kind of it.

Clearly then it is not movement. (We need not distinguish at present between 'movement' and 'change'.)

11

But neither does time exist without change; for when the state of our own minds does not change at all, or we have not noticed its changing, we do not realize that time has elapsed, any more than those who are fabled to sleep among the heroes in Sardinia do when they are awakened; for they connect the earlier 'now' with the later and make them one, cutting out the interval because of their failure to notice it. So, just as, if the 'now' were not different but one and the same, there would not have been time, so too when its difference escapes our notice the interval does not seem to be time. If, then, the non-realization of the existence of time happens to us when we do not distinguish any change, but the soul seems to stay in one indivisible state, and when we perceive and distinguish we say time has elapsed, evidently time is not independent of movement and change. It is evident, then, that time is neither movement nor independent of movement.

We must take this as our starting-point and try to discover – since we wish to know what time is – what exactly it has to do with movement.

Now we perceive movement and time together: for even when it is dark and we are not being affected through the body, if any movement takes place in the mind we at once suppose that some time also has elapsed; and not only that but also, when some time is thought to have passed, some movement also along with it seems to have taken place. Hence time is either movement or something that belongs to movement. Since then it is not movement, it must be the other.

But what is moved is moved from something to something, and all magnitude is continuous. Therefore the movement goes with the magnitude. Because the magnitude is continuous, the movement too must be continuous, and if the movement, then

the time; for the time that has passed is always thought to be in proportion to the movement.

The distinction of 'before' and 'after' holds primarily, then, in place; and there in virtue of relative position. Since then 'before' and 'after' hold in magnitude, they must hold also in movement, these corresponding to those. But also in time the distinction of 'before' and 'after' must hold, for time and movement always correspond with each other. The 'before' and 'after' in motion is identical in substratum with motion yet differs from it in definition, and is not identical with motion.

But we apprehend time only when we have marked motion, marking it by 'before' and 'after'; and it is only when we have perceived 'before' and 'after' in motion that we say that time has elapsed. Now we mark them by judging that A and B are different, and that some third thing is intermediate to them. When we think of the extremes as different from the middle and the mind pronounces that the 'nows' are two, one before and one after, it is then that we say that there is time, and this that we say is time. For what is bounded by the 'now' is thought to be time – we may assume this.

When, therefore, we perceive the 'now' one, and neither as before and after in a motion nor as an identity but in relation to a 'before' and an 'after', no time is thought to have elapsed, because there has been no motion either. On the other hand, when we do perceive a 'before' and an 'after', then we say that there is time. For time is just this – number of motion in respect of 'before' and 'after'.

Hence time is not movement, but only movement in so far as it admits of enumeration. A proof of this: we discriminate the more or the less by number, but more or less movement by time. Time then is a kind of number. (Number, we must note, is used in two senses – both of what is counted or the countable

and also of that with which we count. Time obviously is what is counted, not that with which we count: there are different kinds of thing.) Just as motion is a perpetual succession, so also is time. But every simultaneous time is self-identical; for the 'now' as a subject is an identity, but it accepts different attributes. The 'now' measures time, in so far as time involves the 'before and after'.

The 'now' in one sense is the same, in another it is not the same. In so far as it is in succession, it is different (which is just what its being was supposed to mean), but its substratum is an identity: for motion, as was said, goes with magnitude, and time, as we maintain, with motion. Similarly, then, there corresponds to the point the body which is carried along, and by which we are aware of the motion and of the 'before and after' involved in it. This is an identical substratum (whether a point or a stone or something else of the kind), but it has different attributes as the sophists assume that Coriscus' being in the Lyceum is a different thing from Coriscus' being in the market-place. And the body which is carried along is different, in so far as it is at one time here and at another there. But the 'now' corresponds to the body that is carried along, as time corresponds to the motion. For it is by means of the body that is carried along that we become aware of the 'before and after' the motion, and if we regard these as countable we get the 'now'. Hence in these also the 'now' as substratum remains the same (for it is what is before and after in movement), but what is predicated of it is different; for it is in so far as the 'before and after' is numerable that we get the 'now'. This is what is most knowable: for, similarly, motion is known because of that which is moved, locomotion because of that which is carried. what is carried is a real thing, the movement is not. Thus what is called 'now' in one sense is always the same; in another it is not the same: for this is true also of what is carried.

Clearly, too, if there were no time, there would be no 'now', and vice versa. just as the moving body and its locomotion involve each other mutually, so too do the number of the moving body and the number of its locomotion. For the number of the locomotion is time, while the 'now' corresponds to the moving body, and is like the unit of number.

Time, then, also is both made continuous by the 'now' and divided at it. For here too there is a correspondence with the locomotion and the moving body. For the motion or locomotion is made one by the thing which is moved, because it is one – not because it is one in its own nature (for there might be pauses in the movement of such a thing) – but because it is one in definition: for this determines the movement as 'before' and 'after'. Here, too there is a correspondence with the point; for the point also both connects and terminates the length – it is the beginning of one and the end of another. But when you take it in this way, using the one point as two, a pause is necessary, if the same point is to be the beginning and the end. The 'now' on the other hand, since the body carried is moving, is always different.

Hence time is not number in the sense in which there is 'number' of the same point because it is beginning and end, but rather as the extremities of a line form a number, and not as the parts of the line do so, both for the reason given (for we can use the middle point as two, so that on that analogy time might stand still), and further because obviously the 'now' is no part of time nor the section any part of the movement, any more than the points are parts of the line – for it is two lines that are parts of one line.

In so far then as the 'now' is a boundary, it is not time, but an attribute of it; in so far as it numbers, it is number; for boundaries belong only to that which they bound, but number

(e.g. ten) is the number of these horses, and belongs also elsewhere.

It is clear, then, that time is 'number of movement in respect of the before and after', and is continuous since it is an attribute of what is continuous.

12

The smallest number, in the strict sense of the word 'number', is two. But of number as concrete, sometimes there is a minimum, sometimes not: e.g. of a 'line', the smallest in respect of multiplicity is two (or, if you like, one), but in respect of size there is no minimum; for every line is divided ad infinitum. Hence it is so with time. In respect of number the minimum is one (or two); in point of extent there is no minimum.

It is clear, too, that time is not described as fast or slow, but as many or few and as long or short. For as continuous it is long or short and as a number many or few, but it is not fast or slow – any more than any number with which we number is fast or slow.

Further, there is the same time everywhere at once, but not the same time before and after, for while the present change is one, the change which has happened and that which will happen are different. Time is not number with which we count, but the number of things which are counted, and this according as it occurs before or after is always different, for the 'nows' are different. And the number of a hundred horses and a hundred men is the same, but the things numbered are different – the horses from the men. Further, as a movement can be one and

the same again and again, so too can time, e.g. a year or a spring or an autumn.

Not only do we measure the movement by the time, but also the time by the movement, because they define each other. The time marks the movement, since it is its number, and the movement the time. We describe the time as much or little, measuring it by the movement, just as we know the number by what is numbered, e.g. the number of the horses by one horse as the unit. For we know how many horses there are by the use of the number; and again by using the one horse as unit we know the number of the horses itself. So it is with the time and the movement; for we measure the movement by the time and vice versa. It is natural that this should happen; for the movement goes with the distance and the time with the movement, because they are quanta and continuous and divisible. The movement has these attributes because the distance is of this nature, and the time has them because of the movement. And we measure both the distance by the movement and the movement by the distance; for we say that the road is long, if the journey is long, and that this is long, if the road is long – the time, too, if the movement, and the movement, if the time.

Time is a measure of motion and of being moved, and it measures the motion by determining a motion which will measure exactly the whole motion, as the cubit does the length by determining an amount which will measure out the whole. Further 'to be in time' means for movement, that both it and its essence are measured by time (for simultaneously it measures both the movement and its essence, and this is what being in time means for it, that its essence should be measured).

Clearly then 'to be in time' has the same meaning for other things also, namely, that their being should be measured by

time. ‘To be in time’ is one of two things: (1) to exist when time exists, (2) as we say of some things that they are ‘in number’. The latter means either what is a part or mode of number – in general, something which belongs to number – or that things have a number.

Now, since time is number, the ‘now’ and the ‘before’ and the like are in time, just as ‘unit’ and ‘odd’ and ‘even’ are in number, i.e. in the sense that the one set belongs to number, the other to time. But things are in time as they are in number. If this is so, they are contained by time as things in place are contained by place.

Plainly, too, to be in time does not mean to co-exist with time, any more than to be in motion or in place means to co-exist with motion or place. For if ‘to be in something’ is to mean this, then all things will be in anything, and the heaven will be in a grain; for when the grain is, then also is the heaven. But this is a merely incidental conjunction, whereas the other is necessarily involved: that which is in time necessarily involves that there is time when it is, and that which is in motion that there is motion when it is.

Since what is ‘in time’ is so in the same sense as what is in number is so, a time greater than everything in time can be found. So it is necessary that all the things in time should be contained by time, just like other things also which are ‘in anything’, e.g. the things ‘in place’ by place.

A thing, then, will be affected by time, just as we are accustomed to say that time wastes things away, and that all things grow old through time, and that there is oblivion owing to the lapse of time, but we do not say the same of getting to know or of becoming young or fair. For time is by its nature the cause rather of decay, since it is the number of change, and change removes what is.

Hence, plainly, things which are always are not, as such, in time, for they are not contained time, nor is their being measured by time. A proof of this is that none of them is affected by time, which indicates that they are not in time.

Since time is the measure of motion, it will be the measure of rest too – indirectly. For all rest is in time. For it does not follow that what is in time is moved, though what is in motion is necessarily moved. For time is not motion, but 'number of motion': and what is at rest, also, can be in the number of motion. Not everything that is not in motion can be said to be 'at rest' – but only that which can be moved, though it actually is not moved, as was said above.

'To be in number' means that there is a number of the thing, and that its being is measured by the number in which it is. Hence if a thing is 'in time' it will be measured by time. But time will measure what is moved and what is at rest, the one qua moved, the other qua at rest; for it will measure their motion and rest respectively.

Hence what is moved will not be measurable by the time simply in so far as it has quantity, but in so far as its motion has quantity. Thus none of the things which are neither moved nor at rest are in time: for 'to be in time' is 'to be measured by time', while time is the measure of motion and rest.

Plainly, then, neither will everything that does not exist be in time, i.e. those non-existent things that cannot exist, as the diagonal cannot be commensurate with the side.

Generally, if time is directly the measure of motion and indirectly of other things, it is clear that a thing whose existence is measured by it will have its existence in rest or motion. Those things therefore which are subject to perishing and becoming – generally, those which at one time exist, at

another do not – are necessarily in time: for there is a greater time which will extend both beyond their existence and beyond the time which measures their existence. Of things which do not exist but are contained by time some were, e.g. Homer once was, some will be, e.g. a future event; this depends on the direction in which time contains them; if on both, they have both modes of existence. As to such things as it does not contain in any way, they neither were nor are nor will be. These are those nonexistents whose opposites always are, as the incommensurability of the diagonal always is – and this will not be in time. Nor will the commensurability, therefore; hence this eternally is not, because it is contrary to what eternally is. A thing whose contrary is not eternal can be and not be, and it is of such things that there is coming to be and passing away.

13

The 'now' is the link of time, as has been said (for it connects past and future time), and it is a limit of time (for it is the beginning of the one and the end of the other). But this is not obvious as it is with the point, which is fixed. It divides potentially, and in so far as it is dividing the 'now' is always different, but in so far as it connects it is always the same, as it is with mathematical lines. For the intellect it is not always one and the same point, since it is other and other when one divides the line; but in so far as it is one, it is the same in every respect.

So the 'now' also is in one way a potential dividing of time, in another the termination of both parts, and their unity. And the dividing and the uniting are the same thing and in the same reference, but in essence they are not the same.

So one kind of 'now' is described in this way: another is when the time is near this kind of 'now'. 'He will come now' because he will come to-day; 'he has come now' because he came to-day. But the things in the Iliad have not happened 'now', nor is the flood 'now' – not that the time from now to them is not continuous, but because they are not near.

'At some time' means a time determined in relation to the first of the two types of 'now', e.g. 'at some time' Troy was taken, and 'at some time' there will be a flood; for it must be determined with reference to the 'now'. There will thus be a determinate time from this 'now' to that, and there was such in reference to the past event. But if there be no time which is not 'sometime', every time will be determined.

Will time then fail? Surely not, if motion always exists. Is time then always different or does the same time recur? Clearly time is, in the same way as motion is. For if one and the same motion sometimes recurs, it will be one and the same time, and if not, not.

Since the 'now' is an end and a beginning of time, not of the same time however, but the end of that which is past and the beginning of that which is to come, it follows that, as the circle has its convexity and its concavity, in a sense, in the same thing, so time is always at a beginning and at an end. And for this reason it seems to be always different; for the 'now' is not the beginning and the end of the same thing; if it were, it would be at the same time and in the same respect two opposites. And time will not fail; for it is always at a beginning.

'Presently' or 'just' refers to the part of future time which is near the indivisible present 'now' ('When do you walk? 'Presently', because the time in which he is going to do so is near), and to the part of past time which is not far from the 'now' ('When do you walk?' 'I have just been walking'). But to say that Troy has

just been taken – we do not say that, because it is too far from the 'now'. 'Lately', too, refers to the part of past time which is near the present 'now'. 'When did you go?' 'Lately', if the time is near the existing now. 'Long ago' refers to the distant past.

'Suddenly' refers to what has departed from its former condition in a time imperceptible because of its smallness; but it is the nature of all change to alter things from their former condition. In time all things come into being and pass away; for which reason some called it the wisest of all things, but the Pythagorean Paron called it the most stupid, because in it we also forget; and his was the truer view. It is clear then that it must be in itself, as we said before, the condition of destruction rather than of coming into being (for change, in itself, makes things depart from their former condition), and only incidentally of coming into being, and of being. A sufficient evidence of this is that nothing comes into being without itself moving somehow and acting, but a thing can be destroyed even if it does not move at all. And this is what, as a rule, we chiefly mean by a thing's being destroyed by time. Still, time does not work even this change; even this sort of change takes place incidentally in time.

We have stated, then, that time exists and what it is, and in how many senses we speak of the 'now', and what 'at some time', 'lately', 'presently' or 'just', 'long ago', and 'suddenly' mean.

14

These distinctions having been drawn, it is evident that every change and everything that moves is in time; for the distinction of faster and slower exists in reference to all change, since it is found in every instance. In the phrase 'moving faster' I refer to

that which changes before another into the condition in question, when it moves over the same interval and with a regular movement; e.g. in the case of locomotion, if both things move along the circumference of a circle, or both along a straight line; and similarly in all other cases. But what is before is in time; for we say 'before' and 'after' with reference to the distance from the 'now', and the 'now' is the boundary of the past and the future; so that since 'nows' are in time, the before and the after will be in time too; for in that in which the 'now' is, the distance from the 'now' will also be. But 'before' is used contrariwise with reference to past and to future time; for in the past we call 'before' what is farther from the 'now', and 'after' what is nearer, but in the future we call the nearer 'before' and the farther 'after'. So that since the 'before' is in time, and every movement involves a 'before', evidently every change and every movement is in time.

It is also worth considering how time can be related to the soul; and why time is thought to be in everything, both in earth and in sea and in heaven. Is because it is an attribute, or state, or movement (since it is the number of movement) and all these things are movable (for they are all in place), and time and movement are together, both in respect of potentiality and in respect of actuality?

Whether if soul did not exist time would exist or not, is a question that may fairly be asked; for if there cannot be some one to count there cannot be anything that can be counted, so that evidently there cannot be number; for number is either what has been, or what can be, counted. But if nothing but soul, or in soul reason, is qualified to count, there would not be time unless there were soul, but only that of which time is an attribute, i.e. if movement can exist without soul, and the before and after are attributes of movement, and time is these qua numerable.

One might also raise the question what sort of movement time is the number of. Must we not say 'of any kind'? For things both come into being in time and pass away, and grow, and are altered in time, and are moved locally; thus it is of each movement qua movement that time is the number. And so it is simply the number of continuous movement, not of any particular kind of it.

But other things as well may have been moved now, and there would be a number of each of the two movements. Is there another time, then, and will there be two equal times at once? Surely not. For a time that is both equal and simultaneous is one and the same time, and even those that are not simultaneous are one in kind; for if there were dogs, and horses, and seven of each, it would be the same number. So, too, movements that have simultaneous limits have the same time, yet the one may in fact be fast and the other not, and one may be locomotion and the other alteration; still the time of the two changes is the same if their number also is equal and simultaneous; and for this reason, while the movements are different and separate, the time is everywhere the same, because the number of equal and simultaneous movements is everywhere one and the same.

Now there is such a thing as locomotion, and in locomotion there is included circular movement, and everything is measured by some one thing homogeneous with it, units by a unit, horses by a horse, and similarly times by some definite time, and, as we said, time is measured by motion as well as motion by time (this being so because by a motion definite in time the quantity both of the motion and of the time is measured): if, then, what is first is the measure of everything homogeneous with it, regular circular motion is above all else the measure, because the number of this is the best known. Now neither alteration nor increase nor coming into being can

be regular, but locomotion can be. This also is why time is thought to be the movement of the sphere, viz. because the other movements are measured by this, and time by this movement.

This also explains the common saying that human affairs form a circle, and that there is a circle in all other things that have a natural movement and coming into being and passing away. This is because all other things are discriminated by time, and end and begin as though conforming to a cycle; for even time itself is thought to be a circle. And this opinion again is held because time is the measure of this kind of locomotion and is itself measured by such. So that to say that the things that come into being form a circle is to say that there is a circle of time; and this is to say that it is measured by the circular movement; for apart from the measure nothing else to be measured is observed; the whole is just a plurality of measures.

It is said rightly, too, that the number of the sheep and of the dogs is the same number if the two numbers are equal, but not the same decad or the same ten; just as the equilateral and the scalene are not the same triangle, yet they are the same figure, because they are both triangles. For things are called the same so-and-so if they do not differ by a differentia of that thing, but not if they do; e.g. triangle differs from triangle by a differentia of triangle, therefore they are different triangles; but they do not differ by a differentia of figure, but are in one and the same division of it. For a figure of the one kind is a circle and a figure of another kind of triangle, and a triangle of one kind is equilateral and a triangle of another kind scalene. They are the same figure, then, that, triangle, but not the same triangle. Therefore the number of two groups also – is the same number (for their number does not differ by a differentia of number), but it is not the same decad; for the things of which it is asserted differ; one group are dogs, and the other horses.

We have now discussed time – both time itself and the matters appropriate to the consideration of it.

Book V

1

Everything which changes does so in one of three senses. It may change (1) accidentally, as for instance when we say that something musical walks, that which walks being something in which aptitude for music is an accident. Again (2) a thing is said without qualification to change because something belonging to it changes, i.e. in statements which refer to part of the thing in question: thus the body is restored to health because the eye or the chest, that is to say a part of the whole body, is restored to health. And above all there is (3) the case of a thing which is in motion neither accidentally nor in respect of something else belonging to it, but in virtue of being itself directly in motion. Here we have a thing which is essentially movable: and that which is so is a different thing according to the particular variety of motion: for instance it may be a thing capable of alteration: and within the sphere of alteration it is again a different thing according as it is capable of being restored to health or capable of being heated. And there are the same distinctions in the case of the mover: (1) one thing causes motion accidentally, (2) another partially (because something belonging to it causes motion), (3) another of itself directly, as,

for instance, the physician heals, the hand strikes. We have, then, the following factors: (a) on the one hand that which directly causes motion, and (b) on the other hand that which is in motion: further, we have (c) that in which motion takes place, namely time, and (distinct from these three) (d) that from which and (e) that to which it proceeds: for every motion proceeds from something and to something, that which is directly in motion being distinct from that to which it is in motion and that from which it is in motion: for instance, we may take the three things 'wood', 'hot', and 'cold', of which the first is that which is in motion, the second is that to which the motion proceeds, and the third is that from which it proceeds. This being so, it is clear that the motion is in the wood, not in its form: for the motion is neither caused nor experienced by the form or the place or the quantity. So we are left with a mover, a moved, and a goal of motion. I do not include the starting-point of motion: for it is the goal rather than the starting-point of motion that gives its name to a particular process of change. Thus 'perishing' is change to not-being, though it is also true that that that which perishes changes from being: and 'becoming' is change to being, though it is also change from not-being.

Now a definition of motion has been given above, from which it will be seen that every goal of motion, whether it be a form, an affection, or a place, is immovable, as, for instance, knowledge and heat. Here, however, a difficulty may be raised. Affections, it may be said, are motions, and whiteness is an affection: thus there may be change to a motion. To this we may reply that it is not whiteness but whitening that is a motion. Here also the same distinctions are to be observed: a goal of motion may be so accidentally, or partially and with reference to something other than itself, or directly and with no reference to anything else: for instance, a thing which is becoming white changes accidentally to an object of thought, the colour being only

accidentally the object of thought; it changes to colour, because white is a part of colour, or to Europe, because Athens is a part of Europe; but it changes essentially to white colour. It is now clear in what sense a thing is in motion essentially, accidentally, or in respect of something other than itself, and in what sense the phrase 'itself directly' is used in the case both of the mover and of the moved: and it is also clear that the motion is not in the form but in that which is in motion, that is to say 'the movable in activity'. Now accidental change we may leave out of account: for it is to be found in everything, at any time, and in any respect. Change which is not accidental on the other hand is not to be found in everything, but only in contraries, in things intermediate contraries, and in contradictories, as may be proved by induction. An intermediate may be a starting-point of change, since for the purposes of the change it serves as contrary to either of two contraries: for the intermediate is in a sense the extremes. Hence we speak of the intermediate as in a sense a contrary relatively to the extremes and of either extreme as a contrary relatively to the intermediate: for instance, the central note is low relatively to the highest and high relatively to the lowest, and grey is light relatively to black and dark relatively to white.

And since every change is from something to something – as the word itself (metabole) indicates, implying something 'after' (meta) something else, that is to say something earlier and something later – that which changes must change in one of four ways: from subject to subject, from subject to nonsubject, from non-subject to subject, or from non-subject to non-subject, where by 'subject' I mean what is affirmatively expressed. So it follows necessarily from what has been said above that there are only three kinds of change, that from subject to subject, that from subject to non-subject, and that from non-subject to subject: for the fourth conceivable kind, that from non-subject

to non-subject, is not change, as in that case there is no opposition either of contraries or of contradictories.

Now change from non-subject to subject, the relation being that of contradiction, is 'coming to be' – 'unqualified coming to be' when the change takes place in an unqualified way, 'particular coming to be' when the change is change in a particular character: for instance, a change from not-white to white is a coming to be of the particular thing, white, while change from unqualified not-being to being is coming to be in an unqualified way, in respect of which we say that a thing 'comes to be' without qualification, not that it 'comes to be' some particular thing. Change from subject to non-subject is 'perishing' – 'unqualified perishing' when the change is from being to not-being, 'particular perishing' when the change is to the opposite negation, the distinction being the same as that made in the case of coming to be.

Now the expression 'not-being' is used in several senses: and there can be motion neither of that which 'is not' in respect of the affirmation or negation of a predicate, nor of that which 'is not' in the sense that it only potentially 'is', that is to say the opposite of that which actually 'is' in an unqualified sense: for although that which is 'not-white' or 'not-good' may nevertheless he in motion accidentally (for example that which is 'not-white' might be a man), yet that which is without qualification 'not-so-and-so' cannot in any sense be in motion: therefore it is impossible for that which is not to be in motion. This being so, it follows that 'becoming' cannot be a motion: for it is that which 'is not' that 'becomes'. For however true it may be that it accidentally 'becomes', it is nevertheless correct to say that it is that which 'is not' that in an unqualified sense 'becomes'. And similarly it is impossible for that which 'is not' to be at rest.

There are these difficulties, then, in the way of the assumption that that which ‘is not’ can be in motion: and it may be further objected that, whereas everything which is in motion is in space, that which ‘is not’ is not in space: for then it would be somewhere.

So, too, ‘perishing’ is not a motion: for a motion has for its contrary either another motion or rest, whereas ‘perishing’ is the contrary of ‘becoming’.

Since, then, every motion is a kind of change, and there are only the three kinds of change mentioned above, and since of these three those which take the form of ‘becoming’ and ‘perishing’, that is to say those which imply a relation of contradiction, are not motions: it necessarily follows that only change from subject to subject is motion. And every such subject is either a contrary or an intermediate (for a privation may be allowed to rank as a contrary) and can be affirmatively expressed, as naked, toothless, or black. If, then, the categories are severally distinguished as Being, Quality, Place, Time, Relation, Quantity, and Activity or Passivity, it necessarily follows that there are three kinds of motion – qualitative, quantitative, and local.

2

In respect of Substance there is no motion, because Substance has no contrary among things that are. Nor is there motion in respect of Relation: for it may happen that when one correlative changes, the other, although this does not itself change, is no longer applicable, so that in these cases the motion is accidental. Nor is there motion in respect of Agent and Patient – in fact there can never be motion of mover and moved, because

there cannot be motion of motion or becoming of becoming or in general change of change.

For in the first place there are two senses in which motion of motion is conceivable. (1) The motion of which there is motion might be conceived as subject; e.g. a man is in motion because he changes from fair to dark. Can it be that in this sense motion grows hot or cold, or changes place, or increases or decreases? Impossible: for change is not a subject. Or (2) can there be motion of motion in the sense that some other subject changes from a change to another mode of being, as e.g. a man changes from falling ill to getting well? Even this is possible only in an accidental sense. For, whatever the subject may be, movement is change from one form to another. (And the same holds good of becoming and perishing, except that in these processes we have a change to a particular kind of opposite, while the other, motion, is a change to a different kind.) So, if there is to be motion of motion, that which is changing from health to sickness must simultaneously be changing from this very change to another. It is clear, then, that by the time that it has become sick, it must also have changed to whatever may be the other change concerned (for that it should be at rest, though logically possible, is excluded by the theory). Moreover this other can never be any casual change, but must be a change from something definite to some other definite thing. So in this case it must be the opposite change, viz. convalescence. It is only accidentally that there can be change of change, e.g. there is a change from remembering to forgetting only because the subject of this change changes at one time to knowledge, at another to ignorance.

In the second place, if there is to be change of change and becoming of becoming, we shall have an infinite regress. Thus if one of a series of changes is to be a change of change, the preceding change must also be so: e.g. if simple becoming was

ever in process of becoming, then that which was becoming simple becoming was also in process of becoming, so that we should not yet have arrived at what was in process of simple becoming but only at what was already in process of becoming in process of becoming. And this again was sometime in process of becoming, so that even then we should not have arrived at what was in process of simple becoming. And since in an infinite series there is no first term, here there will be no first stage and therefore no following stage either. On this hypothesis, then, nothing can become or be moved or change.

Thirdly, if a thing is capable of any particular motion, it is also capable of the corresponding contrary motion or the corresponding coming to rest, and a thing that is capable of becoming is also capable of perishing: consequently, if there be becoming of becoming, that which is in process of becoming is in process of perishing at the very moment when it has reached the stage of becoming: since it cannot be in process of perishing when it is just beginning to become or after it has ceased to become: for that which is in process of perishing must be in existence.

Fourthly, there must be a substrate underlying all processes of becoming and changing. What can this be in the present case? It is either the body or the soul that undergoes alteration: what is it that correspondingly becomes motion or becoming? And again what is the goal of their motion? It must be the motion or becoming of something from something to something else. But in what sense can this be so? For the becoming of learning cannot be learning: so neither can the becoming of becoming be becoming, nor can the becoming of any process be that process.

Finally, since there are three kinds of motion, the substratum and the goal of motion must be one or other of these, e.g. locomotion will have to be altered or to be locally moved.

To sum up, then, since everything that is moved is moved in one of three ways, either accidentally, or partially, or essentially, change can change only accidentally, as e.g. when a man who is being restored to health runs or learns: and accidental change we have long ago decided to leave out of account.

Since, then, motion can belong neither to Being nor to Relation nor to Agent and Patient, it remains that there can be motion only in respect of Quality, Quantity, and Place: for with each of these we have a pair of contraries. Motion in respect of Quality let us call alteration, a general designation that is used to include both contraries: and by Quality I do not here mean a property of substance (in that sense that which constitutes a specific distinction is a quality) but a passive quality in virtue of which a thing is said to be acted on or to be incapable of being acted on. Motion in respect of Quantity has no name that includes both contraries, but it is called increase or decrease according as one or the other is designated: that is to say motion in the direction of complete magnitude is increase, motion in the contrary direction is decrease. Motion in respect of Place has no name either general or particular: but we may designate it by the general name of locomotion, though strictly the term 'locomotion' is applicable to things that change their place only when they have not the power to come to a stand, and to things that do not move themselves locally.

Change within the same kind from a lesser to a greater or from a greater to a lesser degree is alteration: for it is motion either from a contrary or to a contrary, whether in an unqualified or in a qualified sense: for change to a lesser degree of a quality will be called change to the contrary of that quality, and change to a greater degree of a quality will be regarded as change from the contrary of that quality to the quality itself. It makes no difference whether the change be qualified or unqualified, except that in the former case the contraries will have to be

contrary to one another only in a qualified sense: and a thing's possessing a quality in a greater or in a lesser degree means the presence or absence in it of more or less of the opposite quality. It is now clear, then, that there are only these three kinds of motion.

The term 'immovable' we apply in the first place to that which is absolutely incapable of being moved (just as we correspondingly apply the term invisible to sound); in the second place to that which is moved with difficulty after a long time or whose movement is slow at the start – in fact, what we describe as hard to move; and in the third place to that which is naturally designed for and capable of motion, but is not in motion when, where, and as it naturally would be so. This last is the only kind of immovable thing of which I use the term 'being at rest': for rest is contrary to motion, so that rest will be negation of motion in that which is capable of admitting motion.

The foregoing remarks are sufficient to explain the essential nature of motion and rest, the number of kinds of change, and the different varieties of motion.

3

Let us now proceed to define the terms 'together' and 'apart', 'in contact', 'between', 'in succession', 'contiguous', and 'continuous', and to show in what circumstances each of these terms is naturally applicable.

Things are said to be together in place when they are in one place (in the strictest sense of the word 'place') and to be apart when they are in different places.

Things are said to be in contact when their extremities are together.

That which a changing thing, if it changes continuously in a natural manner, naturally reaches before it reaches that to which it changes last, is between. Thus 'between' implies the presence of at least three things: for in a process of change it is the contrary that is 'last': and a thing is moved continuously if it leaves no gap or only the smallest possible gap in the material – not in the time (for a gap in the time does not prevent things having a 'between', while, on the other hand, there is nothing to prevent the highest note sounding immediately after the lowest) but in the material in which the motion takes place. This is manifestly true not only in local changes but in every other kind as well. (Now every change implies a pair of opposites, and opposites may be either contraries or contradictories; since then contradiction admits of no mean term, it is obvious that 'between' must imply a pair of contraries) That is locally contrary which is most distant in a straight line: for the shortest line is definitely limited, and that which is definitely limited constitutes a measure.

A thing is 'in succession' when it is after the beginning in position or in form or in some other respect in which it is definitely so regarded, and when further there is nothing of the same kind as itself between it and that to which it is in succession, e.g. a line or lines if it is a line, a unit or units if it is a unit, a house if it is a house (there is nothing to prevent something of a different kind being between). For that which is in succession is in succession to a particular thing, and is something posterior: for one is not 'in succession' to two, nor is the first day of the month to be second: in each case the latter is 'in succession' to the former.

A thing that is in succession and touches is ‘contiguous’. The ‘continuous’ is a subdivision of the contiguous: things are called continuous when the touching limits of each become one and the same and are, as the word implies, contained in each other: continuity is impossible if these extremities are two. This definition makes it plain that continuity belongs to things that naturally in virtue of their mutual contact form a unity. And in whatever way that which holds them together is one, so too will the whole be one, e.g. by a rivet or glue or contact or organic union.

It is obvious that of these terms ‘in succession’ is first in order of analysis: for that which touches is necessarily in succession, but not everything that is in succession touches: and so succession is a property of things prior in definition, e.g. numbers, while contact is not. And if there is continuity there is necessarily contact, but if there is contact, that alone does not imply continuity: for the extremities of things may be ‘together’ without necessarily being one: but they cannot be one without being necessarily together. So natural junction is last in coming to be: for the extremities must necessarily come into contact if they are to be naturally joined: but things that are in contact are not all naturally joined, while there is no contact clearly there is no natural junction either. Hence, if as some say ‘point’ and ‘unit’ have an independent existence of their own, it is impossible for the two to be identical: for points can touch while units can only be in succession. Moreover, there can always be something between points (for all lines are intermediate between points), whereas it is not necessary that there should possibly be anything between units: for there can be nothing between the numbers one and two.

We have now defined what is meant by ‘together’ and ‘apart’, ‘contact’, ‘between’ and ‘in succession’, ‘contiguous’ and

‘continuous’: and we have shown in what circumstances each of these terms is applicable.

4

There are many senses in which motion is said to be ‘one’: for we use the term ‘one’ in many senses.

Motion is one generically according to the different categories to which it may be assigned: thus any locomotion is one generically with any other locomotion, whereas alteration is different generically from locomotion.

Motion is one specifically when besides being one generically it also takes place in a species incapable of subdivision: e.g. colour has specific differences: therefore blackening and whitening differ specifically; but at all events every whitening will be specifically the same with every other whitening and every blackening with every other blackening. But white is not further subdivided by specific differences: hence any whitening is specifically one with any other whitening. Where it happens that the genus is at the same time a species, it is clear that the motion will then in a sense be one specifically though not in an unqualified sense: learning is an example of this, knowledge being on the one hand a species of apprehension and on the other hand a genus including the various knowledges. A difficulty, however, may be raised as to whether a motion is specifically one when the same thing changes from the same to the same, e.g. when one point changes again and again from a particular place to a particular place: if this motion is specifically one, circular motion will be the same as rectilinear motion, and rolling the same as walking. But is not this difficulty removed by the principle already laid down that if that

in which the motion takes place is specifically different (as in the present instance the circular path is specifically different from the straight) the motion itself is also different? We have explained, then, what is meant by saying that motion is one generically or one specifically.

Motion is one in an unqualified sense when it is one essentially or numerically: and the following distinctions will make clear what this kind of motion is. There are three classes of things in connexion with which we speak of motion, the 'that which', the 'that in which', and the 'that during which'. I mean that there must he something that is in motion, e.g. a man or gold, and it must be in motion in something, e.g. a place or an affection, and during something, for all motion takes place during a time. Of these three it is the thing in which the motion takes place that makes it one generically or specifically, it is the thing moved that makes the motion one in subject, and it is the time that makes it consecutive: but it is the three together that make it one without qualification: to effect this, that in which the motion takes place (the species) must be one and incapable of subdivision, that during which it takes place (the time) must be one and unintermittent, and that which is in motion must be one – not in an accidental sense (i.e. it must be one as the white that blackens is one or Coriscus who walks is one, not in the accidental sense in which Coriscus and white may be one), nor merely in virtue of community of nature (for there might be a case of two men being restored to health at the same time in the same way, e.g. from inflammation of the eye, yet this motion is not really one, but only specifically one).

Suppose, however, that Socrates undergoes an alteration specifically the same but at one time and again at another: in this case if it is possible for that which ceased to be again to come into being and remain numerically the same, then this motion too will be one: otherwise it will be the same but not

one. And akin to this difficulty there is another; viz. is health one? and generally are the states and affections in bodies severally one in essence although (as is clear) the things that contain them are obviously in motion and in flux? Thus if a person's health at daybreak and at the present moment is one and the same, why should not this health be numerically one with that which he recovers after an interval? The same argument applies in each case. There is, however, we may answer, this difference: that if the states are two then it follows simply from this fact that the activities must also in point of number be two (for only that which is numerically one can give rise to an activity that is numerically one), but if the state is one, this is not in itself enough to make us regard the activity also as one: for when a man ceases walking, the walking no longer is, but it will again be if he begins to walk again. But, be this as it may, if in the above instance the health is one and the same, then it must be possible for that which is one and the same to come to be and to cease to be many times. However, these difficulties lie outside our present inquiry.

Since every motion is continuous, a motion that is one in an unqualified sense must (since every motion is divisible) be continuous, and a continuous motion must be one. There will not be continuity between any motion and any other indiscriminately any more than there is between any two things chosen at random in any other sphere: there can be continuity only when the extremities of the two things are one. Now some things have no extremities at all: and the extremities of others differ specifically although we give them the same name of 'end': how should e.g. the 'end' of a line and the 'end' of walking touch or come to be one? Motions that are not the same either specifically or generically may, it is true, be consecutive (e.g. a man may run and then at once fall ill of a fever), and again, in the torch-race we have consecutive but not continuous locomotion: for according to our definition there can be

continuity only when the ends of the two things are one. Hence motions may be consecutive or successive in virtue of the time being continuous, but there can be continuity only in virtue of the motions themselves being continuous, that is when the end of each is one with the end of the other. Motion, therefore, that is in an unqualified sense continuous and one must be specifically the same, of one thing, and in one time. Unity is required in respect of time in order that there may be no interval of immobility, for where there is intermission of motion there must be rest, and a motion that includes intervals of rest will be not one but many, so that a motion that is interrupted by stationariness is not one or continuous, and it is so interrupted if there is an interval of time. And though of a motion that is not specifically one (even if the time is unintermittent) the time is one, the motion is specifically different, and so cannot really be one, for motion that is one must be specifically one, though motion that is specifically one is not necessarily one in an unqualified sense. We have now explained what we mean when we call a motion one without qualification.

Further, a motion is also said to be one generically, specifically, or essentially when it is complete, just as in other cases completeness and wholeness are characteristics of what is one: and sometimes a motion even if incomplete is said to be one, provided only that it is continuous.

And besides the cases already mentioned there is another in which a motion is said to be one, viz. when it is regular: for in a sense a motion that is irregular is not regarded as one, that title belonging rather to that which is regular, as a straight line is regular, the irregular being as such divisible. But the difference would seem to be one of degree. In every kind of motion we may have regularity or irregularity: thus there may be regular alteration, and locomotion in a regular path, e.g. in a circle or on a straight line, and it is the same with regard to increase and

decrease. The difference that makes a motion irregular is sometimes to be found in its path: thus a motion cannot be regular if its path is an irregular magnitude, e.g. a broken line, a spiral, or any other magnitude that is not such that any part of it taken at random fits on to any other that may be chosen. Sometimes it is found neither in the place nor in the time nor in the goal but in the manner of the motion: for in some cases the motion is differentiated by quickness and slowness: thus if its velocity is uniform a motion is regular, if not it is irregular. So quickness and slowness are not species of motion nor do they constitute specific differences of motion, because this distinction occurs in connexion with all the distinct species of motion. The same is true of heaviness and lightness when they refer to the same thing: e.g. they do not specifically distinguish earth from itself or fire from itself. Irregular motion, therefore, while in virtue of being continuous it is one, is so in a lesser degree, as is the case with locomotion in a broken line: and a lesser degree of something always means an admixture of its contrary. And since every motion that is one can be both regular and irregular, motions that are consecutive but not specifically the same cannot be one and continuous: for how should a motion composed of alteration and locomotion be regular? If a motion is to be regular its parts ought to fit one another.

5

We have further to determine what motions are contrary to each other, and to determine similarly how it is with rest. And we have first to decide whether contrary motions are motions respectively from and to the same thing, e.g. a motion from health and a motion to health (where the opposition, it would seem, is of the same kind as that between coming to be and

ceasing to be); or motions respectively from contraries, e.g. a motion from health and a motion from disease; or motions respectively to contraries, e.g. a motion to health and a motion to disease; or motions respectively from a contrary and to the opposite contrary, e.g. a motion from health and a motion to disease; or motions respectively from a contrary to the opposite contrary and from the latter to the former, e.g. a motion from health to disease and a motion from disease to health: for motions must be contrary to one another in one or more of these ways, as there is no other way in which they can be opposed.

Now motions respectively from a contrary and to the opposite contrary, e.g. a motion from health and a motion to disease, are not contrary motions: for they are one and the same. (Yet their essence is not the same, just as changing from health is different from changing to disease.) Nor are motion respectively from a contrary and from the opposite contrary contrary motions, for a motion from a contrary is at the same time a motion to a contrary or to an intermediate (of this, however, we shall speak later), but changing to a contrary rather than changing from a contrary would seem to be the cause of the contrariety of motions, the latter being the loss, the former the gain, of contrariness. Moreover, each several motion takes its name rather from the goal than from the starting-point of change, e.g. motion to health we call convalescence, motion to disease sickening. Thus we are left with motions respectively to contraries, and motions respectively to contraries from the opposite contraries. Now it would seem that motions to contraries are at the same time motions from contraries (though their essence may not be the same; 'to health' is distinct, I mean, from 'from disease', and 'from health' from 'to disease').

Since then change differs from motion (motion being change from a particular subject to a particular subject), it follows that contrary motions are motions respectively from a contrary to the opposite contrary and from the latter to the former, e.g. a motion from health to disease and a motion from disease to health. Moreover, the consideration of particular examples will also show what kinds of processes are generally recognized as contrary: thus falling ill is regarded as contrary to recovering one's health, these processes having contrary goals, and being taught as contrary to being led into error by another, it being possible to acquire error, like knowledge, either by one's own agency or by that of another. Similarly we have upward locomotion and downward locomotion, which are contrary lengthwise, locomotion to the right and locomotion to the left, which are contrary breadthwise, and forward locomotion and backward locomotion, which too are contraries. On the other hand, a process simply to a contrary, e.g. that denoted by the expression 'becoming white', where no starting-point is specified, is a change but not a motion. And in all cases of a thing that has no contrary we have as contraries change from and change to the same thing. Thus coming to be is contrary to ceasing to be, and losing to gaining. But these are changes and not motions. And wherever a pair of contraries admit of an intermediate, motions to that intermediate must be held to be in a sense motions to one or other of the contraries: for the intermediate serves as a contrary for the purposes of the motion, in whichever direction the change may be, e.g. grey in a motion from grey to white takes the place of black as starting-point, in a motion from white to grey it takes the place of black as goal, and in a motion from black to grey it takes the place of white as goal: for the middle is opposed in a sense to either of the extremes, as has been said above. Thus we see that two motions are contrary to each other only when one is a motion

from a contrary to the opposite contrary and the other is a motion from the latter to the former.

6

But since a motion appears to have contrary to it not only another motion but also a state of rest, we must determine how this is so. A motion has for its contrary in the strict sense of the term another motion, but it also has for an opposite a state of rest (for rest is the privation of motion and the privation of anything may be called its contrary), and motion of one kind has for its opposite rest of that kind, e.g. local motion has local rest. This statement, however, needs further qualification: there remains the question, is the opposite of remaining at a particular place motion from or motion to that place? It is surely clear that since there are two subjects between which motion takes place, motion from one of these (A) to its contrary (B) has for its opposite remaining in A while the reverse motion has for its opposite remaining in B. At the same time these two are also contrary to each other: for it would be absurd to suppose that there are contrary motions and not opposite states of rest. States of rest in contraries are opposed. To take an example, a state of rest in health is (1) contrary to a state of rest in disease, and (2) the motion to which it is contrary is that from health to disease. For (2) it would be absurd that its contrary motion should be that from disease to health, since motion to that in which a thing is at rest is rather a coming to rest, the coming to rest being found to come into being simultaneously with the motion; and one of these two motions it must be. And (1) rest in whiteness is of course not contrary to rest in health.

Of all things that have no contraries there are opposite changes (viz. change from the thing and change to the thing, e.g. change from being and change to being), but no motion. So, too, of such things there is no remaining though there is absence of change. Should there be a particular subject, absence of change in its being will be contrary to absence of change in its not-being. And here a difficulty may be raised: if not-being is not a particular something, what is it, it may be asked, that is contrary to absence of change in a thing's being? and is this absence of change a state of rest? If it is, then either it is not true that every state of rest is contrary to a motion or else coming to be and ceasing to be are motion. It is clear then that, since we exclude these from among motions, we must not say that this absence of change is a state of rest: we must say that it is similar to a state of rest and call it absence of change. And it will have for its contrary either nothing or absence of change in the thing's not-being, or the ceasing to be of the thing: for such ceasing to be is change from it and the thing's coming to be is change to it.

Again, a further difficulty may be raised. How is it, it may be asked, that whereas in local change both remaining and moving may be natural or unnatural, in the other changes this is not so? e.g. alteration is not now natural and now unnatural, for convalescence is no more natural or unnatural than falling ill, whitening no more natural or unnatural than blackening; so, too, with increase and decrease: these are not contrary to each other in the sense that either of them is natural while the other is unnatural, nor is one increase contrary to another in this sense; and the same account may be given of becoming and perishing: it is not true that becoming is natural and perishing unnatural (for growing old is natural), nor do we observe one becoming to be natural and another unnatural. We answer that if what happens under violence is unnatural, then violent perishing is unnatural and as such contrary to natural perishing. Are there then also some becomings that are violent

and not the result of natural necessity, and are therefore contrary to natural becomings, and violent increases and decreases, e.g. the rapid growth to maturity of profligates and the rapid ripening of seeds even when not packed close in the earth? And how is it with alterations? Surely just the same: we may say that some alterations are violent while others are natural, e.g. patients alter naturally or unnaturally according as they throw off fevers on the critical days or not. But, it may be objected, then we shall have perishings contrary to one another, not to becoming. Certainly: and why should not this in a sense be so? Thus it is so if one perishing is pleasant and another painful: and so one perishing will be contrary to another not in an unqualified sense, but in so far as one has this quality and the other that.

Now motions and states of rest universally exhibit contrariety in the manner described above, e.g. upward motion and rest above are respectively contrary to downward motion and rest below, these being instances of local contrariety; and upward locomotion belongs naturally to fire and downward to earth, i.e. the locomotions of the two are contrary to each other. And again, fire moves up naturally and down unnaturally: and its natural motion is certainly contrary to its unnatural motion. Similarly with remaining: remaining above is contrary to motion from above downwards, and to earth this remaining comes unnaturally, this motion naturally. So the unnatural remaining of a thing is contrary to its natural motion, just as we find a similar contrariety in the motion of the same thing: one of its motions, the upward or the downward, will be natural, the other unnatural.

Here, however, the question arises, has every state of rest that is not permanent a becoming, and is this becoming a coming to a standstill? If so, there must be a becoming of that which is at rest unnaturally, e.g. of earth at rest above: and therefore this

earth during the time that it was being carried violently upward was coming to a standstill. But whereas the velocity of that which comes to a standstill seems always to increase, the velocity of that which is carried violently seems always to decrease: so it will he in a state of rest without having become so. Moreover 'coming to a standstill' is generally recognized to be identical or at least concomitant with the locomotion of a thing to its proper place.

There is also another difficulty involved in the view that remaining in a particular place is contrary to motion from that place. For when a thing is moving from or discarding something, it still appears to have that which is being discarded, so that if a state of rest is itself contrary to the motion from the state of rest to its contrary, the contraries rest and motion will be simultaneously predicable of the same thing. May we not say, however, that in so far as the thing is still stationary it is in a state of rest in a qualified sense? For, in fact, whenever a thing is in motion, part of it is at the starting-point while part is at the goal to which it is changing: and consequently a motion finds its true contrary rather in another motion than in a state of rest.

With regard to motion and rest, then, we have now explained in what sense each of them is one and under what conditions they exhibit contrariety.

[With regard to coming to a standstill the question may be raised whether there is an opposite state of rest to unnatural as well as to natural motions. It would be absurd if this were not the case: for a thing may remain still merely under violence: thus we shall have a thing being in a non-permanent state of rest without having become so. But it is clear that it must be the case: for just as there is unnatural motion, so, too, a thing may be in an unnatural state of rest. Further, some things have a natural and an unnatural motion, e.g. fire has a natural upward

motion and an unnatural downward motion: is it, then, this unnatural downward motion or is it the natural downward motion of earth that is contrary to the natural upward motion? Surely it is clear that both are contrary to it though not in the same sense: the natural motion of earth is contrary inasmuch as the motion of fire is also natural, whereas the upward motion of fire as being natural is contrary to the downward motion of fire as being unnatural. The same is true of the corresponding cases of remaining. But there would seem to be a sense in which a state of rest and a motion are opposites.]

Book VI

1

Now if the terms 'continuous', 'in contact', and 'in succession' are understood as defined above things being 'continuous' if their extremities are one, 'in contact' if their extremities are together, and 'in succession' if there is nothing of their own kind intermediate between them – nothing that is continuous can be composed 'of indivisibles': e.g. a line cannot be composed of points, the line being continuous and the point indivisible. For the extremities of two points can neither be one (since of an indivisible there can be no extremity as distinct from some other part) nor together (since that which has no parts can have no extremity, the extremity and the thing of which it is the extremity being distinct).

Moreover, if that which is continuous is composed of points, these points must be either continuous or in contact with one another: and the same reasoning applies in the case of all indivisibles. Now for the reason given above they cannot be continuous: and one thing can be in contact with another only if whole is in contact with whole or part with part or part with whole. But since indivisibles have no parts, they must be in contact with one another as whole with whole. And if they are in contact with one another as whole with whole, they will not be continuous: for that which is continuous has distinct parts: and these parts into which it is divisible are different in this way, i.e. spatially separate.

Nor, again, can a point be in succession to a point or a moment to a moment in such a way that length can be composed of points or time of moments: for things are in succession if there is nothing of their own kind intermediate between them, whereas that which is intermediate between points is always a line and that which is intermediate between moments is always a period of time.

Again, if length and time could thus be composed of indivisibles, they could be divided into indivisibles, since each is divisible into the parts of which it is composed. But, as we saw, no continuous thing is divisible into things without parts. Nor can there be anything of any other kind intermediate between the parts or between the moments: for if there could be any such thing it is clear that it must be either indivisible or divisible, and if it is divisible, it must be divisible either into indivisibles or into divisibles that are infinitely divisible, in which case it is continuous.

Moreover, it is plain that everything continuous is divisible into divisibles that are infinitely divisible: for if it were divisible into indivisibles, we should have an indivisible in contact with an

indivisible, since the extremities of things that are continuous with one another are one and are in contact.

The same reasoning applies equally to magnitude, to time, and to motion: either all of these are composed of indivisibles and are divisible into indivisibles, or none. This may be made clear as follows. If a magnitude is composed of indivisibles, the motion over that magnitude must be composed of corresponding indivisible motions: e.g. if the magnitude ABG is composed of the indivisibles A, B, G, each corresponding part of the motion DEZ of O over ABG is indivisible. Therefore, since where there is motion there must be something that is in motion, and where there is something in motion there must be motion, therefore the being-moved will also be composed of indivisibles. So O traversed A when its motion was D, B when its motion was E, and G similarly when its motion was Z. Now a thing that is in motion from one place to another cannot at the moment when it was in motion both be in motion and at the same time have completed its motion at the place to which it was in motion: e.g. if a man is walking to Thebes, he cannot be walking to Thebes and at the same time have completed his walk to Thebes: and, as we saw, O traverses a the partless section A in virtue of the presence of the motion D. Consequently, if O actually passed through A after being in process of passing through, the motion must be divisible: for at the time when O was passing through, it neither was at rest nor had completed its passage but was in an intermediate state: while if it is passing through and has completed its passage at the same moment, then that which is walking will at the moment when it is walking have completed its walk and will be in the place to which it is walking; that is to say, it will have completed its motion at the place to which it is in motion. And if a thing is in motion over the whole KBG and its motion is the three D, E, and Z, and if it is not in motion at all over the partless section A but has completed its motion over it, then the

motion will consist not of motions but of starts, and will take place by a thing's having completed a motion without being in motion: for on this assumption it has completed its passage through A without passing through it. So it will be possible for a thing to have completed a walk without ever walking: for on this assumption it has completed a walk over a particular distance without walking over that distance. Since, then, everything must be either at rest or in motion, and O is therefore at rest in each of the sections A, B, and G, it follows that a thing can be continuously at rest and at the same time in motion: for, as we saw, O is in motion over the whole ABG and at rest in any part (and consequently in the whole) of it. Moreover, if the indivisibles composing DEZ are motions, it would be possible for a thing in spite of the presence in it of motion to be not in motion but at rest, while if they are not motions, it would be possible for motion to be composed of something other than motions.

And if length and motion are thus indivisible, it is neither more nor less necessary that time also be similarly indivisible, that is to say be composed of indivisible moments: for if the whole distance is divisible and an equal velocity will cause a thing to pass through less of it in less time, the time must also be divisible, and conversely, if the time in which a thing is carried over the section A is divisible, this section A must also be divisible.

2

And since every magnitude is divisible into magnitudes – for we have shown that it is impossible for anything continuous to be composed of indivisible parts, and every magnitude is

continuous – it necessarily follows that the quicker of two things traverses a greater magnitude in an equal time, an equal magnitude in less time, and a greater magnitude in less time, in conformity with the definition sometimes given of ‘the quicker’. Suppose that A is quicker than B. Now since of two things that which changes sooner is quicker, in the time ZH, in which A has changed from G to D, B will not yet have arrived at D but will be short of it: so that in an equal time the quicker will pass over a greater magnitude. More than this, it will pass over a greater magnitude in less time: for in the time in which A has arrived at D, B being the slower has arrived, let us say, at E. Then since A has occupied the whole time ZH in arriving at D, will have arrived at O in less time than this, say ZK. Now the magnitude GO that A has passed over is greater than the magnitude GE, and the time ZK is less than the whole time ZH: so that the quicker will pass over a greater magnitude in less time. And from this it is also clear that the quicker will pass over an equal magnitude in less time than the slower. For since it passes over the greater magnitude in less time than the slower, and (regarded by itself) passes over LM the greater in more time than LX the lesser, the time PRh in which it passes over LM will be more than the time PS, which it passes over LX: so that, the time PRh being less than the time PCh in which the slower passes over LX, the time PS will also be less than the time PX: for it is less than the time PRh, and that which is less than something else that is less than a thing is also itself less than that thing. Hence it follows that the quicker will traverse an equal magnitude in less time than the slower. Again, since the motion of anything must always occupy either an equal time or less or more time in comparison with that of another thing, and since, whereas a thing is slower if its motion occupies more time and of equal velocity if its motion occupies an equal time, the quicker is neither of equal velocity nor slower, it follows that the motion of the quicker can occupy neither an equal time

nor more time. It can only be, then, that it occupies less time, and thus we get the necessary consequence that the quicker will pass over an equal magnitude (as well as a greater) in less time than the slower.

And since every motion is in time and a motion may occupy any time, and the motion of everything that is in motion may be either quicker or slower, both quicker motion and slower motion may occupy any time: and this being so, it necessarily follows that time also is continuous. By continuous I mean that which is divisible into divisibles that are infinitely divisible: and if we take this as the definition of continuous, it follows necessarily that time is continuous. For since it has been shown that the quicker will pass over an equal magnitude in less time than the slower, suppose that A is quicker and B slower, and that the slower has traversed the magnitude GD in the time ZH. Now it is clear that the quicker will traverse the same magnitude in less time than this: let us say in the time ZO. Again, since the quicker has passed over the whole D in the time ZO, the slower will in the same time pass over GK, say, which is less than GD. And since B, the slower, has passed over GK in the time ZO, the quicker will pass over it in less time: so that the time ZO will again be divided. And if this is divided the magnitude GK will also be divided just as GD was: and again, if the magnitude is divided, the time will also be divided. And we can carry on this process for ever, taking the slower after the quicker and the quicker after the slower alternately, and using what has been demonstrated at each stage as a new point of departure: for the quicker will divide the time and the slower will divide the length. If, then, this alternation always holds good, and at every turn involves a division, it is evident that all time must be continuous. And at the same time it is clear that all magnitude is also continuous; for the divisions of which time and magnitude respectively are susceptible are the same and equal.

Moreover, the current popular arguments make it plain that, if time is continuous, magnitude is continuous also, inasmuch as a thing asses over half a given magnitude in half the time taken to cover the whole: in fact without qualification it passes over a less magnitude in less time; for the divisions of time and of magnitude will be the same. And if either is infinite, so is the other, and the one is so in the same way as the other; i.e. if time is infinite in respect of its extremities, length is also infinite in respect of its extremities: if time is infinite in respect of divisibility, length is also infinite in respect of divisibility: and if time is infinite in both respects, magnitude is also infinite in both respects.

Hence Zeno's argument makes a false assumption in asserting that it is impossible for a thing to pass over or severally to come in contact with infinite things in a finite time. For there are two senses in which length and time and generally anything continuous are called 'infinite': they are called so either in respect of divisibility or in respect of their extremities. So while a thing in a finite time cannot come in contact with things quantitatively infinite, it can come in contact with things infinite in respect of divisibility: for in this sense the time itself is also infinite: and so we find that the time occupied by the passage over the infinite is not a finite but an infinite time, and the contact with the infinites is made by means of moments not finite but infinite in number.

The passage over the infinite, then, cannot occupy a finite time, and the passage over the finite cannot occupy an infinite time: if the time is infinite the magnitude must be infinite also, and if the magnitude is infinite, so also is the time. This may be shown as follows. Let AB be a finite magnitude, and let us suppose that it is traversed in infinite time G, and let a finite period GD of the time be taken. Now in this period the thing in motion will pass over a certain segment of the magnitude: let BE be the segment

that it has thus passed over. (This will be either an exact measure of AB or less or greater than an exact measure: it makes no difference which it is.) Then, since a magnitude equal to BE will always be passed over in an equal time, and BE measures the whole magnitude, the whole time occupied in passing over AB will be finite: for it will be divisible into periods equal in number to the segments into which the magnitude is divisible. Moreover, if it is the case that infinite time is not occupied in passing over every magnitude, but it is possible to ass over some magnitude, say BE, in a finite time, and if this BE measures the whole of which it is a part, and if an equal magnitude is passed over in an equal time, then it follows that the time like the magnitude is finite. That infinite time will not be occupied in passing over BE is evident if the time be taken as limited in one direction: for as the part will be passed over in less time than the whole, the time occupied in traversing this part must be finite, the limit in one direction being given. The same reasoning will also show the falsity of the assumption that infinite length can be traversed in a finite time. It is evident, then, from what has been said that neither a line nor a surface nor in fact anything continuous can be indivisible.

This conclusion follows not only from the present argument but from the consideration that the opposite assumption implies the divisibility of the indivisible. For since the distinction of quicker and slower may apply to motions occupying any period of time and in an equal time the quicker passes over a greater length, it may happen that it will pass over a length twice, or one and a half times, as great as that passed over by the slower: for their respective velocities may stand to one another in this proportion. Suppose, then, that the quicker has in the same time been carried over a length one and a half times as great as that traversed by the slower, and that the respective magnitudes are divided, that of the quicker, the magnitude ABGD, into three indivisibles, and that of the slower into the two indivisibles EZ,

ZH. Then the time may also be divided into three indivisibles, for an equal magnitude will be passed over in an equal time. Suppose then that it is thus divided into KL, LM, MN. Again, since in the same time the slower has been carried over EZ, ZH, the time may also be similarly divided into two. Thus the indivisible will be divisible, and that which has no parts will be passed over not in an indivisible but in a greater time. It is evident, therefore, that nothing continuous is without parts.

3

The present also is necessarily indivisible – the present, that is, not in the sense in which the word is applied to one thing in virtue of another, but in its proper and primary sense; in which sense it is inherent in all time. For the present is something that is an extremity of the past (no part of the future being on this side of it) and also of the future (no part of the past being on the other side of it): it is, as we have said, a limit of both. And if it is once shown that it is essentially of this character and one and the same, it will at once be evident also that it is indivisible.

Now the present that is the extremity of both times must be one and the same: for if each extremity were different, the one could not be in succession to the other, because nothing continuous can be composed of things having no parts: and if the one is apart from the other, there will be time intermediate between them, because everything continuous is such that there is something intermediate between its limits and described by the same name as itself. But if the intermediate thing is time, it will be divisible: for all time has been shown to be divisible. Thus on this assumption the present is divisible. But if the present is divisible, there will be part of the past in the

future and part of the future in the past: for past time will be marked off from future time at the actual point of division. Also the present will be a present not in the proper sense but in virtue of something else: for the division which yields it will not be a division proper. Furthermore, there will be a part of the present that is past and a part that is future, and it will not always be the same part that is past or future: in fact one and the same present will not be simultaneous: for the time may be divided at many points. If, therefore, the present cannot possibly have these characteristics, it follows that it must be the same present that belongs to each of the two times. But if this is so it is evident that the present is also indivisible: for if it is divisible it will be involved in the same implications as before. It is clear, then, from what has been said that time contains something indivisible, and this is what we call a present.

We will now show that nothing can be in motion in a present. For if this is possible, there can be both quicker and slower motion in the present. Suppose then that in the present N the quicker has traversed the distance AB. That being so, the slower will in the same present traverse a distance less than AB, say AG. But since the slower will have occupied the whole present in traversing AG, the quicker will occupy less than this in traversing it. Thus we shall have a division of the present, whereas we found it to be indivisible. It is impossible, therefore, for anything to be in motion in a present.

Nor can anything be at rest in a present: for, as we were saying, only can be at rest which is naturally designed to be in motion but is not in motion when, where, or as it would naturally be so: since, therefore, nothing is naturally designed to be in motion in a present, it is clear that nothing can be at rest in a present either.

Moreover, inasmuch as it is the same present that belongs to both the times, and it is possible for a thing to be in motion throughout one time and to be at rest throughout the other, and that which is in motion or at rest for the whole of a time will be in motion or at rest as the case may be in any part of it in which it is naturally designed to be in motion or at rest: this being so, the assumption that there can be motion or rest in a present will carry with it the implication that the same thing can at the same time be at rest and in motion: for both the times have the same extremity, viz. the present.

Again, when we say that a thing is at rest, we imply that its condition in whole and in part is at the time of speaking uniform with what it was previously: but the present contains no 'previously': consequently, there can be no rest in it.

It follows then that the motion of that which is in motion and the rest of that which is at rest must occupy time.

4

Further, everything that changes must be divisible. For since every change is from something to something, and when a thing is at the goal of its change it is no longer changing, and when both it itself and all its parts are at the starting-point of its change it is not changing (for that which is in whole and in part in an unvarying condition is not in a state of change); it follows, therefore, that part of that which is changing must be at the starting-point and part at the goal: for as a whole it cannot be in both or in neither. (Here by 'goal of change' I mean that which comes first in the process of change: e.g. in a process of change from white the goal in question will be grey, not black: for it is not necessary that that that which is changing

should be at either of the extremes.) It is evident, therefore, that everything that changes must be divisible.

Now motion is divisible in two senses. In the first place it is divisible in virtue of the time that it occupies. In the second place it is divisible according to the motions of the several parts of that which is in motion: e.g. if the whole AG is in motion, there will be a motion of AB and a motion of BG. That being so, let DE be the motion of the part AB and EZ the motion of the part BG. Then the whole DZ must be the motion of AG: for DZ must constitute the motion of AG inasmuch as DE and EZ severally constitute the motions of each of its parts. But the motion of a thing can never be constituted by the motion of something else: consequently the whole motion is the motion of the whole magnitude.

Again, since every motion is a motion of something, and the whole motion DZ is not the motion of either of the parts (for each of the parts DE, EZ is the motion of one of the parts AB, BG) or of anything else (for, the whole motion being the motion of a whole, the parts of the motion are the motions of the parts of that whole: and the parts of DZ are the motions of AB, BG and of nothing else: for, as we saw, a motion that is one cannot be the motion of more things than one): since this is so, the whole motion will be the motion of the magnitude ABG.

Again, if there is a motion of the whole other than DZ, say the the of each of the arts may be subtracted from it: and these motions will be equal to DE, EZ respectively: for the motion of that which is one must be one. So if the whole motion OI may be divided into the motions of the parts, OI will be equal to DZ: if on the other hand there is any remainder, say KI, this will be a motion of nothing: for it can be the motion neither of the whole nor of the parts (as the motion of that which is one must be one) nor of anything else: for a motion that is continuous must

be the motion of things that are continuous. And the same result follows if the division of OI reveals a surplus on the side of the motions of the parts. Consequently, if this is impossible, the whole motion must be the same as and equal to DZ.

This then is what is meant by the division of motion according to the motions of the parts: and it must be applicable to everything that is divisible into parts.

Motion is also susceptible of another kind of division, that according to time. For since all motion is in time and all time is divisible, and in less time the motion is less, it follows that every motion must be divisible according to time. And since everything that is in motion is in motion in a certain sphere and for a certain time and has a motion belonging to it, it follows that the time, the motion, the being-in-motion, the thing that is in motion, and the sphere of the motion must all be susceptible of the same divisions (though spheres of motion are not all divisible in a like manner: thus quantity is essentially, quality accidentally divisible). For suppose that A is the time occupied by the motion B. Then if all the time has been occupied by the whole motion, it will take less of the motion to occupy half the time, less again to occupy a further subdivision of the time, and so on to infinity. Again, the time will be divisible similarly to the motion: for if the whole motion occupies all the time half the motion will occupy half the time, and less of the motion again will occupy less of the time.

In the same way the being-in-motion will also be divisible. For let G be the whole being-in-motion. Then the being-in-motion that corresponds to half the motion will be less than the whole being-in-motion, that which corresponds to a quarter of the motion will be less again, and so on to infinity. Moreover by setting out successively the being-in-motion corresponding to each of the two motions DG (say) and GE, we may argue that the

whole being-in-motion will correspond to the whole motion (for if it were some other being-in-motion that corresponded to the whole motion, there would be more than one being-in-motion corresponding to the same motion), the argument being the same as that whereby we showed that the motion of a thing is divisible into the motions of the parts of the thing: for if we take separately the being-in-motion corresponding to each of the two motions, we shall see that the whole being-in-motion is continuous.

The same reasoning will show the divisibility of the length, and in fact of everything that forms a sphere of change (though some of these are only accidentally divisible because that which changes is so): for the division of one term will involve the division of all. So, too, in the matter of their being finite or infinite, they will all alike be either the one or the other. And we now see that in most cases the fact that all the terms are divisible or infinite is a direct consequence of the fact that the thing that changes is divisible or infinite: for the attributes 'divisible' and 'infinite' belong in the first instance to the thing that changes. That divisibility does so we have already shown: that infinity does so will be made clear in what follows?

5

Since everything that changes changes from something to something, that which has changed must at the moment when it has first changed be in that to which it has changed. For that which changes retires from or leaves that from which it changes: and leaving, if not identical with changing, is at any rate a consequence of it. And if leaving is a consequence of

changing, having left is a consequence of having changed: for there is a like relation between the two in each case.

One kind of change, then, being change in a relation of contradiction, where a thing has changed from not-being to being it has left not-being. Therefore it will be in being: for everything must either be or not be. It is evident, then, that in contradictory change that which has changed must be in that to which it has changed. And if this is true in this kind of change, it will be true in all other kinds as well: for in this matter what holds good in the case of one will hold good likewise in the case of the rest.

Moreover, if we take each kind of change separately, the truth of our conclusion will be equally evident, on the ground that that that which has changed must be somewhere or in something. For, since it has left that from which it has changed and must be somewhere, it must be either in that to which it has changed or in something else. If, then, that which has changed to B is in something other than B, say G, it must again be changing from G to B: for it cannot be assumed that there is no interval between G and B, since change is continuous. Thus we have the result that the thing that has changed, at the moment when it has changed, is changing to that to which it has changed, which is impossible: that which has changed, therefore, must be in that to which it has changed. So it is evident likewise that which has come to be, at the moment when it has come to be, will be, and that which has ceased to be will not-be: for what we have said applies universally to every kind of change, and its truth is most obvious in the case of contradictory change. It is clear, then, that that which has changed, at the moment when it has first changed, is in that to which it has changed.

We will now show that the 'primary when' in which that which has changed effected the completion of its change must be

indivisible, where by ‘primary’ I mean possessing the characteristics in question of itself and not in virtue of the possession of them by something else belonging to it. For let AG be divisible, and let it be divided at B. If then the completion of change has been effected in AB or again in BG, AG cannot be the primary thing in which the completion of change has been effected. If, on the other hand, it has been changing in both AB and BG (for it must either have changed or be changing in each of them), it must have been changing in the whole AG: but our assumption was that AG contains only the completion of the change. It is equally impossible to suppose that one part of AG contains the process and the other the completion of the change: for then we shall have something prior to what is primary. So that in which the completion of change has been effected must be indivisible. It is also evident, therefore, that that that in which that which has ceased to be has ceased to be and that in which that which has come to be has come to be are indivisible.

But there are two senses of the expression ‘the primary when in which something has changed’. On the one hand it may mean the primary when containing the completion of the process of change – the moment when it is correct to say ‘it has changed’: on the other hand it may mean the primary when containing the beginning of the process of change. Now the primary when that has reference to the end of the change is something really existent: for a change may really be completed, and there is such a thing as an end of change, which we have in fact shown to be indivisible because it is a limit. But that which has reference to the beginning is not existent at all: for there is no such thing as a beginning of a process of change, and the time occupied by the change does not contain any primary when in which the change began. For suppose that AD is such a primary when. Then it cannot be indivisible: for, if it were, the moment immediately preceding the change and the moment in which

the change begins would be consecutive (and moments cannot be consecutive). Again, if the changing thing is at rest in the whole preceding time GA (for we may suppose that it is at rest), it is at rest in A also: so if AD is without parts, it will simultaneously be at rest and have changed: for it is at rest in A and has changed in D. Since then AD is not without parts, it must be divisible, and the changing thing must have changed in every part of it (for if it has changed in neither of the two parts into which AD is divided, it has not changed in the whole either: if, on the other hand, it is in process of change in both parts, it is likewise in process of change in the whole: and if, again, it has changed in one of the two parts, the whole is not the primary when in which it has changed: it must therefore have changed in every part). It is evident, then, that with reference to the beginning of change there is no primary when in which change has been effected: for the divisions are infinite.

So, too, of that which has changed there is no primary part that has changed. For suppose that of AE the primary part that has changed is AZ (everything that changes having been shown to be divisible): and let OI be the time in which DZ has changed. If, then, in the whole time DZ has changed, in half the time there will be a part that has changed, less than and therefore prior to DZ: and again there will be another part prior to this, and yet another, and so on to infinity. Thus of that which changes there cannot be any primary part that has changed. It is evident, then, from what has been said, that neither of that which changes nor of the time in which it changes is there any primary part.

With regard, however, to the actual subject of change – that is to say that in respect of which a thing changes – there is a difference to be observed. For in a process of change we may distinguish three terms – that which changes, that in which it changes, and the actual subject of change, e.g. the man, the time, and the fair complexion. Of these the man and the time

are divisible: but with the fair complexion it is otherwise (though they are all divisible accidentally, for that in which the fair complexion or any other quality is an accident is divisible). For of actual subjects of change it will be seen that those which are classed as essentially, not accidentally, divisible have no primary part. Take the case of magnitudes: let AB be a magnitude, and suppose that it has moved from B to a primary 'where' G. Then if BG is taken to be indivisible, two things without parts will have to be contiguous (which is impossible): if on the other hand it is taken to be divisible, there will be something prior to G to which the magnitude has changed, and something else again prior to that, and so on to infinity, because the process of division may be continued without end. Thus there can be no primary 'where' to which a thing has changed. And if we take the case of quantitative change, we shall get a like result, for here too the change is in something continuous. It is evident, then, that only in qualitative motion can there be anything essentially indivisible.

6

Now everything that changes changes time, and that in two senses: for the time in which a thing is said to change may be the primary time, or on the other hand it may have an extended reference, as e.g. when we say that a thing changes in a particular year because it changes in a particular day. That being so, that which changes must be changing in any part of the primary time in which it changes. This is clear from our definition of 'primary', in which the word is said to express just this: it may also, however, be made evident by the following argument. Let ChRh be the primary time in which that which is in motion is in motion: and (as all time is divisible) let it be

divided at K. Now in the time ChK it either is in motion or is not in motion, and the same is likewise true of the time KRh. Then if it is in motion in neither of the two parts, it will be at rest in the whole: for it is impossible that it should be in motion in a time in no part of which it is in motion. If on the other hand it is in motion in only one of the two parts of the time, ChRh cannot be the primary time in which it is in motion: for its motion will have reference to a time other than ChRh. It must, then, have been in motion in any part of ChRh.

And now that this has been proved, it is evident that everything that is in motion must have been in motion before. For if that which is in motion has traversed the distance KL in the primary time ChRh, in half the time a thing that is in motion with equal velocity and began its motion at the same time will have traversed half the distance. But if this second thing whose velocity is equal has traversed a certain distance in a certain time, the original thing that is in motion must have traversed the same distance in the same time. Hence that which is in motion must have been in motion before.

Again, if by taking the extreme moment of the time – for it is the moment that defines the time, and time is that which is intermediate between moments-we are enabled to say that motion has taken place in the whole time ChRh or in fact in any period of it, motion may likewise be said to have taken place in every other such period. But half the time finds an extreme in the point of division. Therefore motion will have taken place in half the time and in fact in any part of it: for as soon as any division is made there is always a time defined by moments. If, then, all time is divisible, and that which is intermediate between moments is time, everything that is changing must have completed an infinite number of changes.

Again, since a thing that changes continuously and has not perished or ceased from its change must either be changing or have changed in any part of the time of its change, and since it cannot be changing in a moment, it follows that it must have changed at every moment in the time: consequently, since the moments are infinite in number, everything that is changing must have completed an infinite number of changes.

And not only must that which is changing have changed, but that which has changed must also previously have been changing, since everything that has changed from something to something has changed in a period of time. For suppose that a thing has changed from A to B in a moment. Now the moment in which it has changed cannot be the same as that in which it is at A (since in that case it would be in A and B at once): for we have shown above that that that which has changed, when it has changed, is not in that from which it has changed. If, on the other hand, it is a different moment, there will be a period of time intermediate between the two: for, as we saw, moments are not consecutive. Since, then, it has changed in a period of time, and all time is divisible, in half the time it will have completed another change, in a quarter another, and so on to infinity: consequently when it has changed, it must have previously been changing.

Moreover, the truth of what has been said is more evident in the case of magnitude, because the magnitude over which what is changing changes is continuous. For suppose that a thing has changed from G to D. Then if GD is indivisible, two things without parts will be consecutive. But since this is impossible, that which is intermediate between them must be a magnitude and divisible into an infinite number of segments: consequently, before the change is completed, the thing changes to those segments. Everything that has changed, therefore, must previously have been changing: for the same proof also holds

good of change with respect to what is not continuous, changes, that is to say, between contraries and between contradictories. In such cases we have only to take the time in which a thing has changed and again apply the same reasoning. So that which has changed must have been changing and that which is changing must have changed, and a process of change is preceded by a completion of change and a completion by a process: and we can never take any stage and say that it is absolutely the first. The reason of this is that no two things without parts can be contiguous, and therefore in change the process of division is infinite, just as lines may be infinitely divided so that one part is continually increasing and the other continually decreasing.

So it is evident also that that that which has become must previously have been in process of becoming, and that which is in process of becoming must previously have become, everything (that is) that is divisible and continuous: though it is not always the actual thing that is in process of becoming of which this is true: sometimes it is something else, that is to say, some part of the thing in question, e.g. the foundation-stone of a house. So, too, in the case of that which is perishing and that which has perished: for that which becomes and that which perishes must contain an element of infiniteness as an immediate consequence of the fact that they are continuous things: and so a thing cannot be in process of becoming without having become or have become without having been in process of becoming. So, too, in the case of perishing and having perished: perishing must be preceded by having perished, and having perished must be preceded by perishing. It is evident, then, that that which has become must previously have been in process of becoming, and that which is in process of becoming must previously have become: for all magnitudes and all periods of time are infinitely divisible.

Consequently no absolutely first stage of change can be represented by any particular part of space or time which the changing thing may occupy.

7

Now since the motion of everything that is in motion occupies a period of time, and a greater magnitude is traversed in a longer time, it is impossible that a thing should undergo a finite motion in an infinite time, if this is understood to mean not that the same motion or a part of it is continually repeated, but that the whole infinite time is occupied by the whole finite motion. In all cases where a thing is in motion with uniform velocity it is clear that the finite magnitude is traversed in a finite time. For if we take a part of the motion which shall be a measure of the whole, the whole motion is completed in as many equal periods of the time as there are parts of the motion. Consequently, since these parts are finite, both in size individually and in number collectively, the whole time must also be finite: for it will be a multiple of the portion, equal to the time occupied in completing the aforesaid part multiplied by the number of the parts.

But it makes no difference even if the velocity is not uniform. For let us suppose that the line AB represents a finite stretch over which a thing has been moved in the given time, and let GD be the infinite time. Now if one part of the stretch must have been traversed before another part (this is clear, that in the earlier and in the later part of the time a different part of the stretch has been traversed: for as the time lengthens a different part of the motion will always be completed in it, whether the thing in motion changes with uniform velocity or not: and

whether the rate of motion increases or diminishes or remains stationary this is none the less so), let us then take AE a part of the whole stretch of motion AB which shall be a measure of AB. Now this part of the motion occupies a certain period of the infinite time: it cannot itself occupy an infinite time, for we are assuming that that is occupied by the whole AB. And if again I take another part equal to AE, that also must occupy a finite time in consequence of the same assumption. And if I go on taking parts in this way, on the one hand there is no part which will be a measure of the infinite time (for the infinite cannot be composed of finite parts whether equal or unequal, because there must be some unity which will be a measure of things finite in multitude or in magnitude, which, whether they are equal or unequal, are none the less limited in magnitude); while on the other hand the finite stretch of motion AB is a certain multiple of AE: consequently the motion AB must be accomplished in a finite time. Moreover it is the same with coming to rest as with motion. And so it is impossible for one and the same thing to be infinitely in process of becoming or of perishing. The reasoning he will prove that in a finite time there cannot be an infinite extent of motion or of coming to rest, whether the motion is regular or irregular. For if we take a part which shall be a measure of the whole time, in this part a certain fraction, not the whole, of the magnitude will be traversed, because we assume that the traversing of the whole occupies all the time. Again, in another equal part of the time another part of the magnitude will be traversed: and similarly in each part of the time that we take, whether equal or unequal to the part originally taken. It makes no difference whether the parts are equal or not, if only each is finite: for it is clear that while the time is exhausted by the subtraction of its parts, the infinite magnitude will not be thus exhausted, since the process of subtraction is finite both in respect of the quantity subtracted and of the number of times a subtraction is made. Consequently

the infinite magnitude will not be traversed in finite time: and it makes no difference whether the magnitude is infinite in only one direction or in both: for the same reasoning will hold good.

This having been proved, it is evident that neither can a finite magnitude traverse an infinite magnitude in a finite time, the reason being the same as that given above: in part of the time it will traverse a finite magnitude and in each several part likewise, so that in the whole time it will traverse a finite magnitude.

And since a finite magnitude will not traverse an infinite in a finite time, it is clear that neither will an infinite traverse a finite in a finite time. For if the infinite could traverse the finite, the finite could traverse the infinite; for it makes no difference which of the two is the thing in motion; either case involves the traversing of the infinite by the finite. For when the infinite magnitude A is in motion a part of it, say GD, will occupy the finite and then another, and then another, and so on to infinity. Thus the two results will coincide: the infinite will have completed a motion over the finite and the finite will have traversed the infinite: for it would seem to be impossible for the motion of the infinite over the finite to occur in any way other than by the finite traversing the infinite either by locomotion over it or by measuring it. Therefore, since this is impossible, the infinite cannot traverse the finite.

Nor again will the infinite traverse the infinite in a finite time. Otherwise it would also traverse the finite, for the infinite includes the finite. We can further prove this in the same way by taking the time as our starting-point.

Since, then, it is established that in a finite time neither will the finite traverse the infinite, nor the infinite the finite, nor the infinite the infinite, it is evident also that in a finite time there cannot be infinite motion: for what difference does it make

whether we take the motion or the magnitude to be infinite? If either of the two is infinite, the other must be so likewise: for all locomotion is in space.

8

Since everything to which motion or rest is natural is in motion or at rest in the natural time, place, and manner, that which is coming to a stand, when it is coming to a stand, must be in motion: for if it is not in motion it must be at rest: but that which is at rest cannot be coming to rest. From this it evidently follows that coming to a stand must occupy a period of time: for the motion of that which is in motion occupies a period of time, and that which is coming to a stand has been shown to be in motion: consequently coming to a stand must occupy a period of time.

Again, since the terms ‘quicker’ and ‘slower’ are used only of that which occupies a period of time, and the process of coming to a stand may be quicker or slower, the same conclusion follows.

And that which is coming to a stand must be coming to a stand in any part of the primary time in which it is coming to a stand. For if it is coming to a stand in neither of two parts into which the time may be divided, it cannot be coming to a stand in the whole time, with the result that that that which is coming to a stand will not be coming to a stand. If on the other hand it is coming to a stand in only one of the two parts of the time, the whole cannot be the primary time in which it is coming to a stand: for it is coming to a stand in the whole time not primarily but in virtue of something distinct from itself, the argument

being the same as that which we used above about things in motion.

And just as there is no primary time in which that which is in motion is in motion, so too there is no primary time in which that which is coming to a stand is coming to a stand, there being no primary stage either of being in motion or of coming to a stand. For let AB be the primary time in which a thing is coming to a stand. Now AB cannot be without parts: for there cannot be motion in that which is without parts, because the moving thing would necessarily have been already moved for part of the time of its movement: and that which is coming to a stand has been shown to be in motion. But since AB is therefore divisible, the thing is coming to a stand in every one of the parts of AB: for we have shown above that it is coming to a stand in every one of the parts in which it is primarily coming to a stand. Since then, that in which primarily a thing is coming to a stand must be a period of time and not something indivisible, and since all time is infinitely divisible, there cannot be anything in which primarily it is coming to a stand.

Nor again can there be a primary time at which the being at rest of that which is at rest occurred: for it cannot have occurred in that which has no parts, because there cannot be motion in that which is indivisible, and that in which rest takes place is the same as that in which motion takes place: for we defined a state of rest to be the state of a thing to which motion is natural but which is not in motion when (that is to say in that in which) motion would be natural to it. Again, our use of the phrase 'being at rest' also implies that the previous state of a thing is still unaltered, not one point only but two at least being thus needed to determine its presence: consequently that in which a thing is at rest cannot be without parts. Since, then it is divisible, it must be a period of time, and the thing must be at

rest in every one of its parts, as may be shown by the same method as that used above in similar demonstrations.

So there can be no primary part of the time: and the reason is that rest and motion are always in a period of time, and a period of time has no primary part any more than a magnitude or in fact anything continuous: for everything continuous is divisible into an infinite number of parts.

And since everything that is in motion is in motion in a period of time and changes from something to something, when its motion is comprised within a particular period of time essentially – that is to say when it fills the whole and not merely a part of the time in question – it is impossible that in that time that which is in motion should be over against some particular thing primarily. For if a thing – itself and each of its parts – occupies the same space for a definite period of time, it is at rest: for it is in just these circumstances that we use the term 'being at rest' – when at one moment after another it can be said with truth that a thing, itself and its parts, occupies the same space. So if this is being at rest it is impossible for that which is changing to be as a whole, at the time when it is primarily changing, over against any particular thing (for the whole period of time is divisible), so that in one part of it after another it will be true to say that the thing, itself and its parts, occupies the same space. If this is not so and the aforesaid proposition is true only at a single moment, then the thing will be over against a particular thing not for any period of time but only at a moment that limits the time. It is true that at any moment it is always over against something stationary: but it is not at rest: for at a moment it is not possible for anything to be either in motion or at rest. So while it is true to say that that which is in motion is at a moment not in motion and is opposite some particular thing, it cannot in a period of time be

over against that which is at rest: for that would involve the conclusion that that which is in locomotion is at rest.

9

Zeno's reasoning, however, is fallacious, when he says that if everything when it occupies an equal space is at rest, and if that which is in locomotion is always occupying such a space at any moment, the flying arrow is therefore motionless. This is false, for time is not composed of indivisible moments any more than any other magnitude is composed of indivisibles.

Zeno's arguments about motion, which cause so much disquietude to those who try to solve the problems that they present, are four in number. The first asserts the non-existence of motion on the ground that that which is in locomotion must arrive at the half-way stage before it arrives at the goal. This we have discussed above.

The second is the so-called 'Achilles', and it amounts to this, that in a race the quickest runner can never overtake the slowest, since the pursuer must first reach the point whence the pursued started, so that the slower must always hold a lead. This argument is the same in principle as that which depends on bisection, though it differs from it in that the spaces with which we successively have to deal are not divided into halves. The result of the argument is that the slower is not overtaken: but it proceeds along the same lines as the bisection-argument (for in both a division of the space in a certain way leads to the result that the goal is not reached, though the 'Achilles' goes further in that it affirms that even the quickest runner in legendary tradition must fail in his pursuit of the slowest), so that the solution must be the same. And the axiom that that

which holds a lead is never overtaken is false: it is not overtaken, it is true, while it holds a lead: but it is overtaken nevertheless if it is granted that it traverses the finite distance prescribed. These then are two of his arguments.

The third is that already given above, to the effect that the flying arrow is at rest, which result follows from the assumption that time is composed of moments: if this assumption is not granted, the conclusion will not follow.

The fourth argument is that concerning the two rows of bodies, each row being composed of an equal number of bodies of equal size, passing each other on a race-course as they proceed with equal velocity in opposite directions, the one row originally occupying the space between the goal and the middle point of the course and the other that between the middle point and the starting-post. This, he thinks, involves the conclusion that half a given time is equal to double that time. The fallacy of the reasoning lies in the assumption that a body occupies an equal time in passing with equal velocity a body that is in motion and a body of equal size that is at rest; which is false. For instance (so runs the argument), let A, A...be the stationary bodies of equal size, B, B...the bodies, equal in number and in size to A, A...,originally occupying the half of the course from the starting-post to the middle of the A's, and G, G...those originally occupying the other half from the goal to the middle of the A's, equal in number, size, and velocity to B, B....Then three consequences follow:

First, as the B's and the G's pass one another, the first B reaches the last G at the same moment as the first G reaches the last B. Secondly at this moment the first G has passed all the A's, whereas the first B has passed only half the A's, and has consequently occupied only half the time occupied by the first G, since each of the two occupies an equal time in passing each

A. Thirdly, at the same moment all the B's have passed all the G's: for the first G and the first B will simultaneously reach the opposite ends of the course, since (so says Zeno) the time occupied by the first G in passing each of the B's is equal to that occupied by it in passing each of the A's, because an equal time is occupied by both the first B and the first G in passing all the A's. This is the argument, but it presupposed the aforesaid fallacious assumption.

Nor in reference to contradictory change shall we find anything unanswerable in the argument that if a thing is changing from not-white, say, to white, and is in neither condition, then it will be neither white nor not-white: for the fact that it is not wholly in either condition will not preclude us from calling it white or not-white. We call a thing white or not-white not necessarily because it is be one or the other, but cause most of its parts or the most essential parts of it are so: not being in a certain condition is different from not being wholly in that condition. So, too, in the case of being and not-being and all other conditions which stand in a contradictory relation: while the changing thing must of necessity be in one of the two opposites, it is never wholly in either.

Again, in the case of circles and spheres and everything whose motion is confined within the space that it occupies, it is not true to say the motion can be nothing but rest, on the ground that such things in motion, themselves and their parts, will occupy the same position for a period of time, and that therefore they will be at once at rest and in motion. For in the first place the parts do not occupy the same position for any period of time: and in the second place the whole also is always changing to a different position: for if we take the orbit as described from a point A on a circumference, it will not be the same as the orbit as described from B or G or any other point on the same circumference except in an accidental sense, the

sense that is to say in which a musical man is the same as a man. Thus one orbit is always changing into another, and the thing will never be at rest. And it is the same with the sphere and everything else whose motion is confined within the space that it occupies.

10

Our next point is that that which is without parts cannot be in motion except accidentally: i.e. it can be in motion only in so far as the body or the magnitude is in motion and the partless is in motion by inclusion therein, just as that which is in a boat may be in motion in consequence of the locomotion of the boat, or a part may be in motion in virtue of the motion of the whole. (It must be remembered, however, that by 'that which is without parts' I mean that which is quantitatively indivisible (and that the case of the motion of a part is not exactly parallel): for parts have motions belonging essentially and severally to themselves distinct from the motion of the whole. The distinction may be seen most clearly in the case of a revolving sphere, in which the velocities of the parts near the centre and of those on the surface are different from one another and from that of the whole; this implies that there is not one motion but many). As we have said, then, that which is without parts can be in motion in the sense in which a man sitting in a boat is in motion when the boat is travelling, but it cannot be in motion of itself. For suppose that it is changing from AB to BG – either from one magnitude to another, or from one form to another, or from some state to its contradictory – and let D be the primary time in which it undergoes the change. Then in the time in which it is changing it must be either in AB or in BG or partly in one and partly in the other: for this, as we saw, is true of everything that

is changing. Now it cannot be partly in each of the two: for then it would be divisible into parts. Nor again can it be in BG: for then it will have completed the change, whereas the assumption is that the change is in process. It remains, then, that in the time in which it is changing, it is in AB. That being so, it will be at rest: for, as we saw, to be in the same condition for a period of time is to be at rest. So it is not possible for that which has no parts to be in motion or to change in any way: for only one condition could have made it possible for it to have motion, viz. that time should be composed of moments, in which case at any moment it would have completed a motion or a change, so that it would never be in motion, but would always have been in motion. But this we have already shown above to be impossible: time is not composed of moments, just as a line is not composed of points, and motion is not composed of starts: for this theory simply makes motion consist of indivisibles in exactly the same way as time is made to consist of moments or a length of points.

Again, it may be shown in the following way that there can be no motion of a point or of any other indivisible. That which is in motion can never traverse a space greater than itself without first traversing a space equal to or less than itself. That being so, it is evident that the point also must first traverse a space equal to or less than itself. But since it is indivisible, there can be no space less than itself for it to traverse first: so it will have to traverse a distance equal to itself. Thus the line will be composed of points, for the point, as it continually traverses a distance equal to itself, will be a measure of the whole line. But since this is impossible, it is likewise impossible for the indivisible to be in motion.

Again, since motion is always in a period of time and never in a moment, and all time is divisible, for everything that is in motion there must be a time less than that in which it traverses

a distance as great as itself. For that in which it is in motion will be a time, because all motion is in a period of time; and all time has been shown above to be divisible. Therefore, if a point is in motion, there must be a time less than that in which it has itself traversed any distance. But this is impossible, for in less time it must traverse less distance, and thus the indivisible will be divisible into something less than itself, just as the time is so divisible: the fact being that the only condition under which that which is without parts and indivisible could be in motion would have been the possibility of the infinitely small being in motion in a moment: for in the two questions – that of motion in a moment and that of motion of something indivisible – the same principle is involved.

Our next point is that no process of change is infinite: for every change, whether between contradictories or between contraries, is a change from something to something. Thus in contradictory changes the positive or the negative, as the case may be, is the limit, e.g. being is the limit of coming to be and not-being is the limit of ceasing to be: and in contrary changes the particular contraries are the limits, since these are the extreme points of any such process of change, and consequently of every process of alteration: for alteration is always dependent upon some contraries. Similarly contraries are the extreme points of processes of increase and decrease: the limit of increase is to be found in the complete magnitude proper to the peculiar nature of the thing that is increasing, while the limit of decrease is the complete loss of such magnitude. Locomotion, it is true, we cannot show to be finite in this way, since it is not always between contraries. But since that which cannot be cut (in the sense that it is inconceivable that it should be cut, the term 'cannot' being used in several senses) – since it is inconceivable that that which in this sense cannot be cut should be in process of being cut, and generally that that which cannot come to be should be in process of coming to be, it follows that it is

inconceivable that that which cannot complete a change should be in process of changing to that to which it cannot complete a change. If, then, it is to be assumed that that which is in locomotion is in process of changing, it must be capable of completing the change. Consequently its motion is not infinite, and it will not be in locomotion over an infinite distance, for it cannot traverse such a distance.

It is evident, then, that a process of change cannot be infinite in the sense that it is not defined by limits. But it remains to be considered whether it is possible in the sense that one and the same process of change may be infinite in respect of the time which it occupies. If it is not one process, it would seem that there is nothing to prevent its being infinite in this sense; e.g. if a process of locomotion be succeeded by a process of alteration and that by a process of increase and that again by a process of coming to be: in this way there may be motion for ever so far as the time is concerned, but it will not be one motion, because all these motions do not compose one. If it is to be one process, no motion can be infinite in respect of the time that it occupies, with the single exception of rotatory locomotion.

Book VII

1

Everything that is in motion must be moved by something. For if it has not the source of its motion in itself it is evident that it is

moved by something other than itself, for there must be something else that moves it. If on the other hand it has the source of its motion in itself, let AB be taken to represent that which is in motion essentially of itself and not in virtue of the fact that something belonging to it is in motion. Now in the first place to assume that AB, because it is in motion as a whole and is not moved by anything external to itself, is therefore moved by itself – this is just as if, supposing that KL is moving LM and is also itself in motion, we were to deny that KM is moved by anything on the ground that it is not evident which is the part that is moving it and which the part that is moved. In the second place that which is in motion without being moved by anything does not necessarily cease from its motion because something else is at rest, but a thing must be moved by something if the fact of something else having ceased from its motion causes it to be at rest. Thus, if this is accepted, everything that is in motion must be moved by something. For AB, which has been taken to represent that which is in motion, must be divisible since everything that is in motion is divisible. Let it be divided, then, at G. Now if GB is not in motion, then AB will not be in motion: for if it is, it is clear that AG would be in motion while BG is at rest, and thus AB cannot be in motion essentially and primarily. But ex hypothesi AB is in motion essentially and primarily. Therefore if GB is not in motion AB will be at rest. But we have agreed that that which is at rest if something else is not in motion must be moved by something. Consequently, everything that is in motion must be moved by something: for that which is in motion will always be divisible, and if a part of it is not in motion the whole must be at rest.

Since everything that is in motion must be moved by something, let us take the case in which a thing is in locomotion and is moved by something that is itself in motion, and that again is moved by something else that is in motion, and that by something else, and so on continually: then the

series cannot go on to infinity, but there must be some first movent. For let us suppose that this is not so and take the series to be infinite. Let A then be moved by B, B by G, G by D, and so on, each member of the series being moved by that which comes next to it. Then since ex hypothesi the movent while causing motion is also itself in motion, and the motion of the moved and the motion of the movent must proceed simultaneously (for the movent is causing motion and the moved is being moved simultaneously) it is evident that the respective motions of A, B, G, and each of the other moved movents are simultaneous. Let us take the motion of each separately and let E be the motion of A, Z of B, and H and O respectively the motions of G and D: for though they are all moved severally one by another, yet we may still take the motion of each as numerically one, since every motion is from something to something and is not infinite in respect of its extreme points. By a motion that is numerically one I mean a motion that proceeds from something numerically one and the same to something numerically one and the same in a period of time numerically one and the same: for a motion may be the same generically, specifically, or numerically: it is generically the same if it belongs to the same category, e.g. substance or quality: it is specifically the same if it proceeds from something specifically the same to something specifically the same, e.g. from white to black or from good to bad, which is not of a kind specifically distinct: it is numerically the same if it proceeds from something numerically one to something numerically one in the same period of time, e.g. from a particular white to a particular black, or from a particular place to a particular place, in a particular period of time: for if the period of time were not one and the same, the motion would no longer be numerically one though it would still be specifically one.

We have dealt with this question above. Now let us further take the time in which A has completed its motion, and let it be

represented by K. Then since the motion of A is finite the time will also be finite. But since the movents and the things moved are infinite, the motion EZHO, i.e. the motion that is composed of all the individual motions, must be infinite. For the motions of A, B, and the others may be equal, or the motions of the others may be greater: but assuming what is conceivable, we find that whether they are equal or some are greater, in both cases the whole motion is infinite. And since the motion of A and that of each of the others are simultaneous, the whole motion must occupy the same time as the motion of A: but the time occupied by the motion of A is finite: consequently the motion will be infinite in a finite time, which is impossible.

It might be thought that what we set out to prove has thus been shown, but our argument so far does not prove it, because it does not yet prove that anything impossible results from the contrary supposition: for in a finite time there may be an infinite motion, though not of one thing, but of many: and in the case that we are considering this is so: for each thing accomplishes its own motion, and there is no impossibility in many things being in motion simultaneously. But if (as we see to be universally the case) that which primarily is moved locally and corporeally must be either in contact with or continuous with that which moves it, the things moved and the movents must be continuous or in contact with one another, so that together they all form a single unity: whether this unity is finite or infinite makes no difference to our present argument; for in any case since the things in motion are infinite in number the whole motion will be infinite, if, as is theoretically possible, each motion is either equal to or greater than that which follows it in the series: for we shall take as actual that which is theoretically possible. If, then, A, B, G, D form an infinite magnitude that passes through the motion EZHO in the finite time K, this involves the conclusion that an infinite motion is passed through in a finite time: and whether the magnitude in

question is finite or infinite this is in either case impossible. Therefore the series must come to an end, and there must be a first movent and a first moved: for the fact that this impossibility results only from the assumption of a particular case is immaterial, since the case assumed is theoretically possible, and the assumption of a theoretically possible case ought not to give rise to any impossible result.

2

That which is the first movement of a thing – in the sense that it supplies not 'that for the sake of which' but the source of the motion – is always together with that which is moved by it by 'together' I mean that there is nothing intermediate between them). This is universally true wherever one thing is moved by another. And since there are three kinds of motion, local, qualitative, and quantitative, there must also be three kinds of movent, that which causes locomotion, that which causes alteration, and that which causes increase or decrease.

Let us begin with locomotion, for this is the primary motion. Everything that is in locomotion is moved either by itself or by something else. In the case of things that are moved by themselves it is evident that the moved and the movent are together: for they contain within themselves their first movent, so that there is nothing in between. The motion of things that are moved by something else must proceed in one of four ways: for there are four kinds of locomotion caused by something other than that which is in motion, viz. pulling, pushing, carrying, and twirling. All forms of locomotion are reducible to these. Thus pushing on is a form of pushing in which that which is causing motion away from itself follows up that which

it pushes and continues to push it: pushing off occurs when the movent does not follow up the thing that it has moved: throwing when the movent causes a motion away from itself more violent than the natural locomotion of the thing moved, which continues its course so long as it is controlled by the motion imparted to it. Again, pushing apart and pushing together are forms respectively of pushing off and pulling: pushing apart is pushing off, which may be a motion either away from the pusher or away from something else, while pushing together is pulling, which may be a motion towards something else as well as the puller. We may similarly classify all the varieties of these last two, e.g. packing and combing: the former is a form of pushing together, the latter a form of pushing apart. The same is true of the other processes of combination and separation (they will all be found to be forms of pushing apart or of pushing together), except such as are involved in the processes of becoming and perishing. (At same time it is evident that there is no other kind of motion but combination and separation: for they may all be apportioned to one or other of those already mentioned.) Again, inhaling is a form of pulling, exhaling a form of pushing: and the same is true of spitting and of all other motions that proceed through the body, whether secretive or assimilative, the assimilative being forms of pulling, the secretive of pushing off. All other kinds of locomotion must be similarly reduced, for they all fall under one or other of our four heads. And again, of these four, carrying and twirling are to pulling and pushing. For carrying always follows one of the other three methods, for that which is carried is in motion accidentally, because it is in or upon something that is in motion, and that which carries it is in doing so being either pulled or pushed or twirled; thus carrying belongs to all the other three kinds of motion in common. And twirling is a compound of pulling and pushing, for that which is twirling a thing must be pulling one part of the thing and

pushing another part, since it impels one part away from itself and another part towards itself. If, therefore, it can be shown that that which is pushing and that which is pushing and pulling are adjacent respectively to that which is being pushed and that which is being pulled, it will be evident that in all locomotion there is nothing intermediate between moved and movent. But the former fact is clear even from the definitions of pushing and pulling, for pushing is motion to something else from oneself or from something else, and pulling is motion from something else to oneself or to something else, when the motion of that which is pulling is quicker than the motion that would separate from one another the two things that are continuous: for it is this that causes one thing to be pulled on along with the other. (It might indeed be thought that there is a form of pulling that arises in another way: that wood, e.g. pulls fire in a manner different from that described above. But it makes no difference whether that which pulls is in motion or is stationary when it is pulling: in the latter case it pulls to the place where it is, while in the former it pulls to the place where it was.) Now it is impossible to move anything either from oneself to something else or something else to oneself without being in contact with it: it is evident, therefore, that in all locomotion there is nothing intermediate between moved and movent.

Nor again is there anything intermediate between that which undergoes and that which causes alteration: this can be proved by induction: for in every case we find that the respective extremities of that which causes and that which undergoes alteration are adjacent. For our assumption is that things that are undergoing alteration are altered in virtue of their being affected in respect of their so-called affective qualities, since that which is of a certain quality is altered in so far as it is sensible, and the characteristics in which bodies differ from one another are sensible characteristics: for every body differs from

another in possessing a greater or lesser number of sensible characteristics or in possessing the same sensible characteristics in a greater or lesser degree. But the alteration of that which undergoes alteration is also caused by the above-mentioned characteristics, which are affections of some particular underlying quality. Thus we say that a thing is altered by becoming hot or sweet or thick or dry or white: and we make these assertions alike of what is inanimate and of what is animate, and further, where animate things are in question, we make them both of the parts that have no power of sense-perception and of the senses themselves. For in a way even the senses undergo alteration, since the active sense is a motion through the body in the course of which the sense is affected in a certain way. We see, then, that the animate is capable of every kind of alteration of which the inanimate is capable: but the inanimate is not capable of every kind of alteration of which the animate is capable, since it is not capable of alteration in respect of the senses: moreover the inanimate is unconscious of being affected by alteration, whereas the animate is conscious of it, though there is nothing to prevent the animate also being unconscious of it when the process of the alteration does not concern the senses. Since, then, the alteration of that which undergoes alteration is caused by sensible things, in every case of such alteration it is evident that the respective extremities of that which causes and that which undergoes alteration are adjacent. Thus the air is continuous with that which causes the alteration, and the body that undergoes alteration is continuous with the air. Again, the colour is continuous with the light and the light with the sight. And the same is true of hearing and smelling: for the primary movent in respect to the moved is the air. Similarly, in the case of tasting, the flavour is adjacent to the sense of taste. And it is just the same in the case of things that are inanimate and incapable of sense-perception. Thus there

can be nothing intermediate between that which undergoes and that which causes alteration.

Nor, again, can there be anything intermediate between that which suffers and that which causes increase: for the part of the latter that starts the increase does so by becoming attached in such a way to the former that the whole becomes one. Again, the decrease of that which suffers decrease is caused by a part of the thing becoming detached. So that which causes increase and that which causes decrease must be continuous with that which suffers increase and that which suffers decrease respectively: and if two things are continuous with one another there can be nothing intermediate between them.

It is evident, therefore, that between the extremities of the moved and the movent that are respectively first and last in reference to the moved there is nothing intermediate.

3

Everything, we say, that undergoes alteration is altered by sensible causes, and there is alteration only in things that are said to be essentially affected by sensible things. The truth of this is to be seen from the following considerations. Of all other things it would be most natural to suppose that there is alteration in figures and shapes, and in acquired states and in the processes of acquiring and losing these: but as a matter of fact in neither of these two classes of things is there alteration.

In the first place, when a particular formation of a thing is completed, we do not call it by the name of its material: e.g. we do not call the statue 'bronze' or the pyramid 'wax' or the bed 'wood', but we use a derived expression and call them 'of

bronze', 'waxen', and 'wooden' respectively. But when a thing has been affected and altered in any way we still call it by the original name: thus we speak of the bronze or the wax being dry or fluid or hard or hot.

And not only so: we also speak of the particular fluid or hot substance as being bronze, giving the material the same name as that which we use to describe the affection.

Since, therefore, having regard to the figure or shape of a thing we no longer call that which has become of a certain figure by the name of the material that exhibits the figure, whereas having regard to a thing's affections or alterations we still call it by the name of its material, it is evident that becomings of the former kind cannot be alterations.

Moreover it would seem absurd even to speak in this way, to speak, that is to say, of a man or house or anything else that has come into existence as having been altered. Though it may be true that every such becoming is necessarily the result of something's being altered, the result, e.g. of the material's being condensed or rarefied or heated or cooled, nevertheless it is not the things that are coming into existence that are altered, and their becoming is not an alteration.

Again, acquired states, whether of the body or of the soul, are not alterations. For some are excellences and others are defects, and neither excellence nor defect is an alteration: excellence is a perfection (for when anything acquires its proper excellence we call it perfect, since it is then if ever that we have a thing in its natural state: e.g. we have a perfect circle when we have one as good as possible), while defect is a perishing of or departure from this condition. So as when speaking of a house we do not call its arrival at perfection an alteration (for it would be absurd to suppose that the coping or the tiling is an alteration or that in receiving its coping or its tiling a house is altered and not

perfected), the same also holds good in the case of excellences and defects and of the persons or things that possess or acquire them: for excellences are perfections of a thing's nature and defects are departures from it: consequently they are not alterations.

Further, we say that all excellences depend upon particular relations. Thus bodily excellences such as health and a good state of body we regard as consisting in a blending of hot and cold elements within the body in due proportion, in relation either to one another or to the surrounding atmosphere: and in like manner we regard beauty, strength, and all the other bodily excellences and defects. Each of them exists in virtue of a particular relation and puts that which possesses it in a good or bad condition with regard to its proper affections, where by 'proper' affections I mean those influences that from the natural constitution of a thing tend to promote or destroy its existence. Since then, relatives are neither themselves alterations nor the subjects of alteration or of becoming or in fact of any change whatever, it is evident that neither states nor the processes of losing and acquiring states are alterations, though it may be true that their becoming or perishing is necessarily, like the becoming or perishing of a specific character or form, the result of the alteration of certain other things, e.g. hot and cold or dry and wet elements or the elements, whatever they may be, on which the states primarily depend. For each several bodily defect or excellence involves a relation with those things from which the possessor of the defect or excellence is naturally subject to alteration: thus excellence disposes its possessor to be unaffected by these influences or to be affected by those of them that ought to be admitted, while defect disposes its possessor to be affected by them or to be unaffected by those of them that ought to be admitted.

And the case is similar in regard to the states of the soul, all of which (like those of body) exist in virtue of particular relations, the excellences being perfections of nature and the defects departures from it: moreover, excellence puts its possessor in good condition, while defect puts its possessor in a bad condition, to meet his proper affections. Consequently these cannot any more than the bodily states be alterations, nor can the processes of losing and acquiring them be so, though their becoming is necessarily the result of an alteration of the sensitive part of the soul, and this is altered by sensible objects: for all moral excellence is concerned with bodily pleasures and pains, which again depend either upon acting or upon remembering or upon anticipating. Now those that depend upon action are determined by sense-perception, i.e. they are stimulated by something sensible: and those that depend upon memory or anticipation are likewise to be traced to sense-perception, for in these cases pleasure is felt either in remembering what one has experienced or in anticipating what one is going to experience. Thus all pleasure of this kind must be produced by sensible things: and since the presence in any one of moral defect or excellence involves the presence in him of pleasure or pain (with which moral excellence and defect are always concerned), and these pleasures and pains are alterations of the sensitive part, it is evident that the loss and acquisition of these states no less than the loss and acquisition of the states of the body must be the result of the alteration of something else. Consequently, though their becoming is accompanied by an alteration, they are not themselves alterations.

Again, the states of the intellectual part of the soul are not alterations, nor is there any becoming of them. In the first place it is much more true of the possession of knowledge that it depends upon a particular relation. And further, it is evident that there is no becoming of these states. For that which is

potentially possessed of knowledge becomes actually possessed of it not by being set in motion at all itself but by reason of the presence of something else: i.e. it is when it meets with the particular object that it knows in a manner the particular through its knowledge of the universal. (Again, there is no becoming of the actual use and activity of these states, unless it is thought that there is a becoming of vision and touching and that the activity in question is similar to these.) And the original acquisition of knowledge is not a becoming or an alteration: for the terms 'knowing' and 'understanding' imply that the intellect has reached a state of rest and come to a standstill, and there is no becoming that leads to a state of rest, since, as we have said above, change at all can have a becoming. Moreover, just as to say, when any one has passed from a state of intoxication or sleep or disease to the contrary state, that he has become possessed of knowledge again is incorrect in spite of the fact that he was previously incapable of using his knowledge, so, too, when any one originally acquires the state, it is incorrect to say that he becomes possessed of knowledge: for the possession of understanding and knowledge is produced by the soul's settling down out of the restlessness natural to it. Hence, too, in learning and in forming judgements on matters relating to their sense-perceptions children are inferior to adults owing to the great amount of restlessness and motion in their souls. Nature itself causes the soul to settle down and come to a state of rest for the performance of some of its functions, while for the performance of others other things do so: but in either case the result is brought about through the alteration of something in the body, as we see in the case of the use and activity of the intellect arising from a man's becoming sober or being awakened. It is evident, then, from the preceding argument that alteration and being altered occur in sensible things and in the sensitive part of the soul, and, except accidentally, in nothing else.

4

A difficulty may be raised as to whether every motion is commensurable with every other or not. Now if they are all commensurable and if two things to have the same velocity must accomplish an equal motion in an equal time, then we may have a circumference equal to a straight line, or, of course, the one may be greater or less than the other. Further, if one thing alters and another accomplishes a locomotion in an equal time, we may have an alteration and a locomotion equal to one another: thus an affection will be equal to a length, which is impossible. But is it not only when an equal motion is accomplished by two things in an equal time that the velocities of the two are equal? Now an affection cannot be equal to a length. Therefore there cannot be an alteration equal to or less than a locomotion: and consequently it is not the case that every motion is commensurable with every other.

But how will our conclusion work out in the case of the circle and the straight line? It would be absurd to suppose that the motion of one in a circle and of another in a straight line cannot be similar, but that the one must inevitably move more quickly or more slowly than the other, just as if the course of one were downhill and of the other uphill. Moreover it does not as a matter of fact make any difference to the argument to say that the one motion must inevitably be quicker or slower than the other: for then the circumference can be greater or less than the straight line; and if so it is possible for the two to be equal. For if in the time A the quicker (B) passes over the distance B' and the slower (G) passes over the distance G', B' will be greater than G': for this is what we took 'quicker' to mean: and so quicker motion also implies that one thing traverses an equal distance

in less time than another: consequently there will be a part of A in which B will pass over a part of the circle equal to G', while G will occupy the whole of A in passing over G'. None the less, if the two motions are commensurable, we are confronted with the consequence stated above, viz. that there may be a straight line equal to a circle. But these are not commensurable: and so the corresponding motions are not commensurable either.

But may we say that things are always commensurable if the same terms are applied to them without equivocation? e.g. a pen, a wine, and the highest note in a scale are not commensurable: we cannot say whether any one of them is sharper than any other: and why is this? they are incommensurable because it is only equivocally that the same term 'sharp' is applied to them: whereas the highest note in a scale is commensurable with the leading-note, because the term 'sharp' has the same meaning as applied to both. Can it be, then, that the term 'quick' has not the same meaning as applied to straight motion and to circular motion respectively? If so, far less will it have the same meaning as applied to alteration and to locomotion.

Or shall we in the first place deny that things are always commensurable if the same terms are applied to them without equivocation? For the term 'much' has the same meaning whether applied to water or to air, yet water and air are not commensurable in respect of it: or, if this illustration is not considered satisfactory, 'double' at any rate would seem to have the same meaning as applied to each (denoting in each case the proportion of two to one), yet water and air are not commensurable in respect of it. But here again may we not take up the same position and say that the term 'much' is equivocal? In fact there are some terms of which even the definitions are equivocal; e.g. if 'much' were defined as 'so much and more','so much' would mean something different in different cases:

‘equal’ is similarly equivocal; and ‘one’ again is perhaps inevitably an equivocal term; and if ‘one’ is equivocal, so is ‘two’. Otherwise why is it that some things are commensurable while others are not, if the nature of the attribute in the two cases is really one and the same?

Can it be that the incommensurability of two things in respect of any attribute is due to a difference in that which is primarily capable of carrying the attribute? Thus horse and dog are so commensurable that we may say which is the whiter, since that which primarily contains the whiteness is the same in both, viz. the surface: and similarly they are commensurable in respect of size. But water and speech are not commensurable in respect of clearness, since that which primarily contains the attribute is different in the two cases. It would seem, however that we must reject this solution, since clearly we could thus make all equivocal attributes univocal and say merely that that contains each of them is different in different cases: thus ‘equality’, ‘sweetness’, and ‘whiteness’ will severally always be the same, though that which contains them is different in different cases. Moreover, it is not any casual thing that is capable of carrying any attribute: each single attribute can be carried primarily only by one single thing.

Must we then say that, if two things are to be commensurable in respect of any attribute, not only must the attribute in question be applicable to both without equivocation, but there must also be no specific differences either in the attribute itself or in that which contains the attribute – that these, I mean, must not be divisible in the way in which colour is divided into kinds? Thus in this respect one thing will not be commensurable with another, i.e. we cannot say that one is more coloured than the other where only colour in general and not any particular colour is meant; but they are commensurable in respect of whiteness.

Similarly in the case of motion: two things are of the same velocity if they occupy an equal time in accomplishing a certain equal amount of motion. Suppose, then, that in a certain time an alteration is undergone by one half of a body's length and a locomotion is accomplished the other half: can be say that in this case the alteration is equal to the locomotion and of the same velocity? That would be absurd, and the reason is that there are different species of motion. And if in consequence of this we must say that two things are of equal velocity if they accomplish locomotion over an equal distance in an equal time, we have to admit the equality of a straight line and a circumference. What, then, is the reason of this? Is it that locomotion is a genus or that line is a genus? (We may leave the time out of account, since that is one and the same.) If the lines are specifically different, the locomotions also differ specifically from one another: for locomotion is specifically differentiated according to the specific differentiation of that over which it takes place. (It is also similarly differentiated, it would seem, accordingly as the instrument of the locomotion is different: thus if feet are the instrument, it is walking, if wings it is flying; but perhaps we should rather say that this is not so, and that in this case the differences in the locomotion are merely differences of posture in that which is in motion.) We may say, therefore, that things are of equal velocity in an equal time they traverse the same magnitude: and when I call it 'the same' I mean that it contains no specific difference and therefore no difference in the motion that takes place over it. So we have now to consider how motion is differentiated: and this discussion serves to show that the genus is not a unity but contains a plurality latent in it and distinct from it, and that in the case of equivocal terms sometimes the different senses in which they are used are far removed from one another, while sometimes there is a certain likeness between them, and sometimes again they are nearly related either generically or

analogically, with the result that they seem not to be equivocal though they really are.

When, then, is there a difference of species? Is an attribute specifically different if the subject is different while the attribute is the same, or must the attribute itself be different as well? And how are we to define the limits of a species? What will enable us to decide that particular instances of whiteness or sweetness are the same or different? Is it enough that it appears different in one subject from what appears in another? Or must there be no sameness at all? And further, where alteration is in question, how is one alteration to be of equal velocity with another? One person may be cured quickly and another slowly, and cures may also be simultaneous: so that, recovery of health being an alteration, we have here alterations of equal velocity, since each alteration occupies an equal time. But what alteration? We cannot here speak of an 'equal' alteration: what corresponds in the category of quality to equality in the category of quantity is 'likeness'. However, let us say that there is equal velocity where the same change is accomplished in an equal time. Are we, then, to find the commensurability in the subject of the affection or in the affection itself? In the case that we have just been considering it is the fact that health is one and the same that enables us to arrive at the conclusion that the one alteration is neither more nor less than the other, but that both are alike. If on the other hand the affection is different in the two cases, e.g. when the alterations take the form of becoming white and becoming healthy respectively, here there is no sameness or equality or likeness inasmuch as the difference in the affections at once makes the alterations specifically different, and there is no unity of alteration any more than there would be unity of locomotion under like conditions. So we must find out how many species there are of alteration and of locomotion respectively. Now if the things that are in motion – that is to say,

the things to which the motions belong essentially and not accidentally – differ specifically, then their respective motions will also differ specifically: if on the other hand they differ generically or numerically, the motions also will differ generically or numerically as the case may be. But there still remains the question whether, supposing that two alterations are of equal velocity, we ought to look for this equality in the sameness (or likeness) of the affections, or in the things altered, to see e.g. whether a certain quantity of each has become white. Or ought we not rather to look for it in both? That is to say, the alterations are the same or different according as the affections are the same or different, while they are equal or unequal according as the things altered are equal or unequal.

And now we must consider the same question in the case of becoming and perishing: how is one becoming of equal velocity with another? They are of equal velocity if in an equal time there are produced two things that are the same and specifically inseparable, e.g. two men (not merely generically inseparable as e.g. two animals). Similarly one is quicker than the other if in an equal time the product is different in the two cases. I state it thus because we have no pair of terms that will convey this 'difference' in the way in which unlikeness is conveyed. If we adopt the theory that it is number that constitutes being, we may indeed speak of a 'greater number' and a 'lesser number' within the same species, but there is no common term that will include both relations, nor are there terms to express each of them separately in the same way as we indicate a higher degree or preponderance of an affection by 'more', of a quantity by 'greater.'

5

Now since wherever there is a movent, its motion always acts upon something, is always in something, and always extends to something (by 'is always in something' I mean that it occupies a time: and by 'extends to something' I mean that it involves the traversing of a certain amount of distance: for at any moment when a thing is causing motion, it also has caused motion, so that there must always be a certain amount of distance that has been traversed and a certain amount of time that has been occupied). then, A the movement have moved B a distance G in a time D, then in the same time the same force A will move 1/2B twice the distance G, and in 1/2D it will move 1/2B the whole distance for G: thus the rules of proportion will be observed. Again if a given force move a given weight a certain distance in a certain time and half the distance in half the time, half the motive power will move half the weight the same distance in the same time. Let E represent half the motive power A and Z half the weight B: then the ratio between the motive power and the weight in the one case is similar and proportionate to the ratio in the other, so that each force will cause the same distance to be traversed in the same time. But if E move Z a distance G in a time D, it does not necessarily follow that E can move twice Z half the distance G in the same time. If, then, A move B a distance G in a time D, it does not follow that E, being half of A, will in the time D or in any fraction of it cause B to traverse a part of G the ratio between which and the whole of G is proportionate to that between A and E (whatever fraction of AE may be): in fact it might well be that it will cause no motion at all; for it does not follow that, if a given motive power causes a certain amount of motion, half that power will cause motion either of any particular amount or in any length of time: otherwise one man might move a ship, since both the motive power of the ship-haulers and the distance that they all cause the ship to traverse are divisible into as many parts as there are

men. Hence Zeno's reasoning is false when he argues that there is no part of the millet that does not make a sound: for there is no reason why any such part should not in any length of time fail to move the air that the whole bushel moves in falling. In fact it does not of itself move even such a quantity of the air as it would move if this part were by itself: for no part even exists otherwise than potentially.

If on the other hand we have two forces each of which separately moves one of two weights a given distance in a given time, then the forces in combination will move the combined weights an equal distance in an equal time: for in this case the rules of proportion apply.

Then does this hold good of alteration and of increase also? Surely it does, for in any given case we have a definite thing that cause increase and a definite thing that suffers increase, and the one causes and the other suffers a certain amount of increase in a certain amount of time. Similarly we have a definite thing that causes alteration and a definite thing that undergoes alteration, and a certain amount, or rather degree, of alteration is completed in a certain amount of time: thus in twice as much time twice as much alteration will be completed and conversely twice as much alteration will occupy twice as much time: and the alteration of half of its object will occupy half as much time and in half as much time half of the object will be altered: or again, in the same amount of time it will be altered twice as much.

On the other hand if that which causes alteration or increase causes a certain amount of increase or alteration respectively in a certain amount of time, it does not necessarily follow that half the force will occupy twice the time in altering or increasing the object, or that in twice the time the alteration or increase will be

completed by it: it may happen that there will be no alteration or increase at all, the case being the same as with the weight.

Book VIII

1

It remains to consider the following question. Was there ever a becoming of motion before which it had no being, and is it perishing again so as to leave nothing in motion? Or are we to say that it never had any becoming and is not perishing, but always was and always will be? Is it in fact an immortal never-failing property of things that are, a sort of life as it were to all naturally constituted things?

Now the existence of motion is asserted by all who have anything to say about nature, because they all concern themselves with the construction of the world and study the question of becoming and perishing, which processes could not come about without the existence of motion. But those who say that there is an infinite number of worlds, some of which are in process of becoming while others are in process of perishing, assert that there is always motion (for these processes of becoming and perishing of the worlds necessarily involve motion), whereas those who hold that there is only one world, whether everlasting or not, make corresponding assumptions in regard to motion. If then it is possible that at any time nothing should be in motion, this must come about in one of two ways:

either in the manner described by Anaxagoras, who says that all things were together and at rest for an infinite period of time, and that then Mind introduced motion and separated them; or in the manner described by Empedocles, according to whom the universe is alternately in motion and at rest-in motion, when Love is making the one out of many, or Strife is making many out of one, and at rest in the intermediate periods of time – his account being as follows:

'Since One hath learned to spring from Manifold,

And One disjoined makes manifold arise,

Thus they Become, nor stable is their life:

But since their motion must alternate be,

Thus have they ever Rest upon their round':

for we must suppose that he means by this that they alternate from the one motion to the other. We must consider, then, how this matter stands, for the discovery of the truth about it is of importance, not only for the study of nature, but also for the investigation of the First Principle.

Let us take our start from what we have already laid down in our course on Physics. Motion, we say, is the fulfilment of the movable in so far as it is movable. Each kind of motion, therefore, necessarily involves the presence of the things that are capable of that motion. In fact, even apart from the definition of motion, every one would admit that in each kind of motion it is that which is capable of that motion that is in motion: thus it is that which is capable of alteration that is altered, and that which is capable of local change that is in locomotion: and so there must be something capable of being burned before there can be a process of being burned, and something capable of burning before there can be a process of

burning. Moreover, these things also must either have a beginning before which they had no being, or they must be eternal. Now if there was a becoming of every movable thing, it follows that before the motion in question another change or motion must have taken place in which that which was capable of being moved or of causing motion had its becoming. To suppose, on the other hand, that these things were in being throughout all previous time without there being any motion appears unreasonable on a moment's thought, and still more unreasonable, we shall find, on further consideration. For if we are to say that, while there are on the one hand things that are movable, and on the other hand things that are motive, there is a time when there is a first movent and a first moved, and another time when there is no such thing but only something that is at rest, then this thing that is at rest must previously have been in process of change: for there must have been some cause of its rest, rest being the privation of motion. Therefore, before this first change there will be a previous change. For some things cause motion in only one way, while others can produce either of two contrary motions: thus fire causes heating but not cooling, whereas it would seem that knowledge may be directed to two contrary ends while remaining one and the same. Even in the former class, however, there seems to be something similar, for a cold thing in a sense causes heating by turning away and retiring, just as one possessed of knowledge voluntarily makes an error when he uses his knowledge in the reverse way. But at any rate all things that are capable respectively of affecting and being affected, or of causing motion and being moved, are capable of it not under all conditions, but only when they are in a particular condition and approach one another: so it is on the approach of one thing to another that the one causes motion and the other is moved, and when they are present under such conditions as rendered the one motive and the other movable. So if the motion was not

always in process, it is clear that they must have been in a condition not such as to render them capable respectively of being moved and of causing motion, and one or other of them must have been in process of change: for in what is relative this is a necessary consequence: e.g. if one thing is double another when before it was not so, one or other of them, if not both, must have been in process of change. It follows then, that there will be a process of change previous to the first.

(Further, how can there be any 'before' and 'after' without the existence of time? Or how can there be any time without the existence of motion? If, then, time is the number of motion or itself a kind of motion, it follows that, if there is always time, motion must also be eternal. But so far as time is concerned we see that all with one exception are in agreement in saying that it is uncreated: in fact, it is just this that enables Democritus to show that all things cannot have had a becoming: for time, he says, is uncreated. Plato alone asserts the creation of time, saying that it had a becoming together with the universe, the universe according to him having had a becoming. Now since time cannot exist and is unthinkable apart from the moment, and the moment a kind of middle-point, uniting as it does in itself both a beginning and an end, a beginning of future time and an end of past time, it follows that there must always be time: for the extremity of the last period of time that we take must be found in some moment, since time contains no point of contact for us except the moment. Therefore, since the moment is both a beginning and an end, there must always be time on both sides of it. But if this is true of time, it is evident that it must also be true of motion, time being a kind of affection of motion.)

The same reasoning will also serve to show the imperishability of motion: just as a becoming of motion would involve, as we saw, the existence of a process of change previous to the first, in

the same way a perishing of motion would involve the existence of a process of change subsequent to the last: for when a thing ceases to be moved, it does not therefore at the same time cease to be movable – e.g. the cessation of the process of being burned does not involve the cessation of the capacity of being burned, since a thing may be capable of being burned without being in process of being burned – nor, when a thing ceases to be movent, does it therefore at the same time cease to a be motive. Again, the destructive agent will have to be destroyed, after what it destroys has been destroyed, and then that which has the capacity of destroying it will have to be destroyed afterwards, (so that there will be a process of change subsequent to the last,) for being destroyed also is a kind of change. If, then, view which we are criticizing involves these impossible consequences, it is clear that motion is eternal and cannot have existed at one time and not at another: in fact such a view can hardly be described as anythling else than fantastic.

And much the same may be said of the view that such is the ordinance of nature and that this must be regarded as a principle, as would seem to be the view of Empedocles when he says that the constitution of the world is of necessity such that Love and Strife alternately predominate and cause motion, while in the intermediate period of time there is a state of rest. Probably also those who like like Anaxagoras, assert a single principle (of motion) would hold this view. But that which is produced or directed by nature can never be anything disorderly: for nature is everywhere the cause of order. Moreover, there is no ratio in the relation of the infinite to the infinite, whereas order always means ratio. But if we say that there is first a state of rest for an infinite time, and then motion is started at some moment, and that the fact that it is this rather than a previous moment is of no importance, and involves no order, then we can no longer say that it is nature's work: for if anything is of a certain character naturally, it either

is so invariably and is not sometimes of this and sometimes of another character (e.g. fire, which travels upwards naturally, does not sometimes do so and sometimes not) or there is a ratio in the variation. It would be better, therefore, to say with Empedocles and any one else who may have maintained such a theory as his that the universe is alternately at rest and in motion: for in a system of this kind we have at once a certain order. But even here the holder of the theory ought not only to assert the fact: he ought to explain the cause of it: i.e. he should not make any mere assumption or lay down any gratuitous axiom, but should employ either inductive or demonstrative reasoning. The Love and Strife postulated by Empedocles are not in themselves causes of the fact in question, nor is it of the essence of either that it should be so, the essential function of the former being to unite, of the latter to separate. If he is to go on to explain this alternate predominance, he should adduce cases where such a state of things exists, as he points to the fact that among mankind we have something that unites men, namely Love, while on the other hand enemies avoid one another: thus from the observed fact that this occurs in certain cases comes the assumption that it occurs also in the universe. Then, again, some argument is needed to explain why the predominance of each of the two forces lasts for an equal period of time. But it is a wrong assumption to suppose universally that we have an adequate first principle in virtue of the fact that something always is so or always happens so. Thus Democritus reduces the causes that explain nature to the fact that things happened in the past in the same way as they happen now: but he does not think fit to seek for a first principle to explain this 'always': so, while his theory is right in so far as it is applied to certain individual cases, he is wrong in making it of universal application. Thus, a triangle always has its angles equal to two right angles, but there is nevertheless an ulterior cause of the eternity of this truth, whereas first principles are eternal and

have no ulterior cause. Let this conclude what we have to say in support of our contention that there never was a time when there was not motion, and never will be a time when there will not be motion.

2

The arguments that may be advanced against this position are not difficult to dispose of. The chief considerations that might be thought to indicate that motion may exist though at one time it had not existed at all are the following:

First, it may be said that no process of change is eternal: for the nature of all change is such that it proceeds from something to something, so that every process of change must be bounded by the contraries that mark its course, and no motion can go on to infinity.

Secondly, we see that a thing that neither is in motion nor contains any motion within itself can be set in motion; e.g. inanimate things that are (whether the whole or some part is in question) not in motion but at rest, are at some moment set in motion: whereas, if motion cannot have a becoming before which it had no being, these things ought to be either always or never in motion.

Thirdly, the fact is evident above all in the case of animate beings: for it sometimes happens that there is no motion in us and we are quite still, and that nevertheless we are then at some moment set in motion, that is to say it sometimes happens that we produce a beginning of motion in ourselves spontaneously without anything having set us in motion from without. We see nothing like this in the case of inanimate

things, which are always set in motion by something else from without: the animal, on the other hand, we say, moves itself: therefore, if an animal is ever in a state of absolute rest, we have a motionless thing in which motion can be produced from the thing itself, and not from without. Now if this can occur in an animal, why should not the same be true also of the universe as a whole? If it can occur in a small world it could also occur in a great one: and if it can occur in the world, it could also occur in the infinite; that is, if the infinite could as a whole possibly be in motion or at rest.

Of these objections, then, the first-mentioned motion to opposites is not always the same and numerically one a correct statement; in fact, this may be said to be a necessary conclusion, provided that it is possible for the motion of that which is one and the same to be not always one and the same. (I mean that e.g. we may question whether the note given by a single string is one and the same, or is different each time the string is struck, although the string is in the same condition and is moved in the same way.) But still, however this may be, there is nothing to prevent there being a motion that is the same in virtue of being continuous and eternal: we shall have something to say later that will make this point clearer.

As regards the second objection, no absurdity is involved in the fact that something not in motion may be set in motion, that which caused the motion from without being at one time present, and at another absent. Nevertheless, how this can be so remains matter for inquiry; how it comes about, I mean, that the same motive force at one time causes a thing to be in motion, and at another does not do so: for the difficulty raised by our objector really amounts to this – why is it that some things are not always at rest, and the rest always in motion?

The third objection may be thought to present more difficulty than the others, namely, that which alleges that motion arises in things in which it did not exist before, and adduces in proof the case of animate things: thus an animal is first at rest and afterwards walks, not having been set in motion apparently by anything from without. This, however, is false: for we observe that there is always some part of the animal's organism in motion, and the cause of the motion of this part is not the animal itself, but, it may be, its environment. Moreover, we say that the animal itself originates not all of its motions but its locomotion. So it may well be the case – or rather we may perhaps say that it must necessarily be the case – that many motions are produced in the body by its environment, and some of these set in motion the intellect or the appetite, and this again then sets the whole animal in motion: this is what happens when animals are asleep: though there is then no perceptive motion in them, there is some motion that causes them to wake up again. But we will leave this point also to be elucidated at a later stage in our discussion.

3

Our enquiry will resolve itself at the outset into a consideration of the above-mentioned problem – what can be the reason why some things in the world at one time are in motion and at another are at rest again? Now one of three things must be true: either all things are always at rest, or all things are always in motion, or some things are in motion and others at rest: and in this last case again either the things that are in motion are always in motion and the things that are at rest are always at rest, or they are all constituted so as to be capable alike of motion and of rest; or there is yet a third possibility remaining –

it may be that some things in the world are always motionless, others always in motion, while others again admit of both conditions. This last is the account of the matter that we must give: for herein lies the solution of all the difficulties raised and the conclusion of the investigation upon which we are engaged.

To maintain that all things are at rest, and to disregard sense-perception in an attempt to show the theory to be reasonable, would be an instance of intellectual weakness: it would call in question a whole system, not a particular detail: moreover, it would be an attack not only on the physicist but on almost all sciences and all received opinions, since motion plays a part in all of them. Further, just as in arguments about mathematics objections that involve first principles do not affect the mathematician – and the other sciences are in similar case – so, too, objections involving the point that we have just raised do not affect the physicist: for it is a fundamental assumption with him that motion is ultimately referable to nature herself.

The assertion that all things are in motion we may fairly regard as equally false, though it is less subversive of physical science: for though in our course on physics it was laid down that rest no less than motion is ultimately referable to nature herself, nevertheless motion is the characteristic fact of nature: moreover, the view is actually held by some that not merely some things but all things in the world are in motion and always in motion, though we cannot apprehend the fact by sense-perception. Although the supporters of this theory do not state clearly what kind of motion they mean, or whether they mean all kinds, it is no hard matter to reply to them: thus we may point out that there cannot be a continuous process either of increase or of decrease: that which comes between the two has to be included. The theory resembles that about the stone being worn away by the drop of water or split by plants growing out of it: if so much has been extruded or removed by the drop,

it does not follow that half the amount has previously been extruded or removed in half the time: the case of the hauled ship is exactly comparable: here we have so many drops setting so much in motion, but a part of them will not set as much in motion in any period of time. The amount removed is, it is true, divisible into a number of parts, but no one of these was set in motion separately: they were all set in motion together. It is evident, then, that from the fact that the decrease is divisible into an infinite number of parts it does not follow that some part must always be passing away: it all passes away at a particular moment. Similarly, too, in the case of any alteration whatever if that which suffers alteration is infinitely divisible it does not follow from this that the same is true of the alteration itself, which often occurs all at once, as in freezing. Again, when any one has fallen ill, there must follow a period of time in which his restoration to health is in the future: the process of change cannot take place in an instant: yet the change cannot be a change to anything else but health. The assertion. therefore, that alteration is continuous is an extravagant calling into question of the obvious: for alteration is a change from one contrary to another. Moreover, we notice that a stone becomes neither harder nor softer. Again, in the matter of locomotion, it would be a strange thing if a stone could be falling or resting on the ground without our being able to perceive the fact. Further, it is a law of nature that earth and all other bodies should remain in their proper places and be moved from them only by violence: from the fact then that some of them are in their proper places it follows that in respect of place also all things cannot be in motion. These and other similar arguments, then, should convince us that it is impossible either that all things are always in motion or that all things are always at rest.

Nor again can it be that some things are always at rest, others always in motion, and nothing sometimes at rest and sometimes in motion. This theory must be pronounced

impossible on the same grounds as those previously mentioned: viz. that we see the above-mentioned changes occurring in the case of the same things. We may further point out that the defender of this position is fighting against the obvious, for on this theory there can be no such thing as increase: nor can there be any such thing as compulsory motion, if it is impossible that a thing can be at rest before being set in motion unnaturally. This theory, then, does away with becoming and perishing. Moreover, motion, it would seem, is generally thought to be a sort of becoming and perishing, for that to which a thing changes comes to be, or occupancy of it comes to be, and that from which a thing changes ceases to be, or there ceases to be occupancy of it. It is clear, therefore, that there are cases of occasional motion and occasional rest.

We have now to take the assertion that all things are sometimes at rest and sometimes in motion and to confront it with the arguments previously advanced. We must take our start as before from the possibilities that we distinguished just above. Either all things are at rest, or all things are in motion, or some things are at rest and others in motion. And if some things are at rest and others in motion, then it must be that either all things are sometimes at rest and sometimes in motion, or some things are always at rest and the remainder always in motion, or some of the things are always at rest and others always in motion while others again are sometimes at rest and sometimes in motion. Now we have said before that it is impossible that all things should be at rest: nevertheless we may now repeat that assertion. We may point out that, even if it is really the case, as certain persons assert, that the existent is infinite and motionless, it certainly does not appear to be so if we follow sense-perception: many things that exist appear to be in motion. Now if there is such a thing as false opinion or opinion at all, there is also motion; and similarly if there is such a thing as imagination, or if it is the case that anything seems to

be different at different times: for imagination and opinion are thought to be motions of a kind. But to investigate this question at all – to seek a reasoned justification of a belief with regard to which we are too well off to require reasoned justification – implies bad judgement of what is better and what is worse, what commends itself to belief and what does not, what is ultimate and what is not. It is likewise impossible that all things should be in motion or that some things should be always in motion and the remainder always at rest. We have sufficient ground for rejecting all these theories in the single fact that we see some things that are sometimes in motion and sometimes at rest. It is evident, therefore, that it is no less impossible that some things should be always in motion and the remainder always at rest than that all things should be at rest or that all things should be in motion continuously. It remains, then, to consider whether all things are so constituted as to be capable both of being in motion and of being at rest, or whether, while some things are so constituted, some are always at rest and some are always in motion: for it is this last view that we have to show to be true.

4

Now of things that cause motion or suffer motion, to some the motion is accidental, to others essential: thus it is accidental to what merely belongs to or contains as a part a thing that causes motion or suffers motion, essential to a thing that causes motion or suffers motion not merely by belonging to such a thing or containing it as a part.

Of things to which the motion is essential some derive their motion from themselves, others from something else: and in

some cases their motion is natural, in others violent and unnatural. Thus in things that derive their motion from themselves, e.g. all animals, the motion is natural (for when an animal is in motion its motion is derived from itself): and whenever the source of the motion of a thing is in the thing itself we say that the motion of that thing is natural. Therefore the animal as a whole moves itself naturally: but the body of the animal may be in motion unnaturally as well as naturally: it depends upon the kind of motion that it may chance to be suffering and the kind of element of which it is composed. And the motion of things that derive their motion from something else is in some cases natural, in other unnatural: e.g. upward motion of earthy things and downward motion of fire are unnatural. Moreover the parts of animals are often in motion in an unnatural way, their positions and the character of the motion being abnormal. The fact that a thing that is in motion derives its motion from something is most evident in things that are in motion unnaturally, because in such cases it is clear that the motion is derived from something other than the thing itself. Next to things that are in motion unnaturally those whose motion while natural is derived from themselves – e.g. animals – make this fact clear: for here the uncertainty is not as to whether the motion is derived from something but as to how we ought to distinguish in the thing between the movent and the moved. It would seem that in animals, just as in ships and things not naturally organized, that which causes motion is separate from that which suffers motion, and that it is only in this sense that the animal as a whole causes its own motion.

The greatest difficulty, however, is presented by the remaining case of those that we last distinguished. Where things derive their motion from something else we distinguished the cases in which the motion is unnatural: we are left with those that are to be contrasted with the others by reason of the fact that the motion is natural. It is in these cases that difficulty would be

experienced in deciding whence the motion is derived, e.g. in the case of light and heavy things. When these things are in motion to positions the reverse of those they would properly occupy, their motion is violent: when they are in motion to their proper positions – the light thing up and the heavy thing down – their motion is natural; but in this latter case it is no longer evident, as it is when the motion is unnatural, whence their motion is derived. It is impossible to say that their motion is derived from themselves: this is a characteristic of life and peculiar to living things. Further, if it were, it would have been in their power to stop themselves (I mean that if e.g. a thing can cause itself to walk it can also cause itself not to walk), and so, since on this supposition fire itself possesses the power of upward locomotion, it is clear that it should also possess the power of downward locomotion. Moreover if things move themselves, it would be unreasonable to suppose that in only one kind of motion is their motion derived from themselves. Again, how can anything of continuous and naturally connected substance move itself? In so far as a thing is one and continuous not merely in virtue of contact, it is impassive: it is only in so far as a thing is divided that one part of it is by nature active and another passive. Therefore none of the things that we are now considering move themselves (for they are of naturally connected substance), nor does anything else that is continuous: in each case the movent must be separate from the moved, as we see to be the case with inanimate things when an animate thing moves them. It is the fact that these things also always derive their motion from something: what it is would become evident if we were to distinguish the different kinds of cause.

The above-mentioned distinctions can also be made in the case of things that cause motion: some of them are capable of causing motion unnaturally (e.g. the lever is not naturally capable of moving the weight), others naturally (e.g. what is

actually hot is naturally capable of moving what is potentially hot): and similarly in the case of all other things of this kind.

In the same way, too, what is potentially of a certain quality or of a certain quantity in a certain place is naturally movable when it contains the corresponding principle in itself and not accidentally (for the same thing may be both of a certain quality and of a certain quantity, but the one is an accidental, not an essential property of the other). So when fire or earth is moved by something the motion is violent when it is unnatural, and natural when it brings to actuality the proper activities that they potentially possess. But the fact that the term 'potentially' is used in more than one sense is the reason why it is not evident whence such motions as the upward motion of fire and the downward motion of earth are derived. One who is learning a science potentially knows it in a different sense from one who while already possessing the knowledge is not actually exercising it. Wherever we have something capable of acting and something capable of being correspondingly acted on, in the event of any such pair being in contact what is potential becomes at times actual: e.g. the learner becomes from one potential something another potential something: for one who possesses knowledge of a science but is not actually exercising it knows the science potentially in a sense, though not in the same sense as he knew it potentially before he learnt it. And when he is in this condition, if something does not prevent him, he actively exercises his knowledge: otherwise he would be in the contradictory state of not knowing. In regard to natural bodies also the case is similar. Thus what is cold is potentially hot: then a change takes place and it is fire, and it burns, unless something prevents and hinders it. So, too, with heavy and light: light is generated from heavy, e.g. air from water (for water is the first thing that is potentially light), and air is actually light, and will at once realize its proper activity as such unless something prevents it. The activity of lightness consists

in the light thing being in a certain situation, namely high up: when it is in the contrary situation, it is being prevented from rising. The case is similar also in regard to quantity and quality. But, be it noted, this is the question we are trying to answer – how can we account for the motion of light things and heavy things to their proper situations? The reason for it is that they have a natural tendency respectively towards a certain position: and this constitutes the essence of lightness and heaviness, the former being determined by an upward, the latter by a downward, tendency. As we have said, a thing may be potentially light or heavy in more senses than one. Thus not only when a thing is water is it in a sense potentially light, but when it has become air it may be still potentially light: for it may be that through some hindrance it does not occupy an upper position, whereas, if what hinders it is removed, it realizes its activity and continues to rise higher. The process whereby what is of a certain quality changes to a condition of active existence is similar: thus the exercise of knowledge follows at once upon the possession of it unless something prevents it. So, too, what is of a certain quantity extends itself over a certain space unless something prevents it. The thing in a sense is and in a sense is not moved by one who moves what is obstructing and preventing its motion (e.g. one who pulls away a pillar from under a roof or one who removes a stone from a wineskin in the water is the accidental cause of motion): and in the same way the real cause of the motion of a ball rebounding from a wall is not the wall but the thrower. So it is clear that in all these cases the thing does not move itself, but it contains within itself the source of motion – not of moving something or of causing motion, but of suffering it.

If then the motion of all things that are in motion is either natural or unnatural and violent, and all things whose motion is violent and unnatural are moved by something, and something other than themselves, and again all things whose motion is

natural are moved by something – both those that are moved by themselves and those that are not moved by themselves (e.g. light things and heavy things, which are moved either by that which brought the thing into existence as such and made it light and heavy, or by that which released what was hindering and preventing it); then all things that are in motion must be moved by something.

5

Now this may come about in either of two ways. Either the movent is not itself responsible for the motion, which is to be referred to something else which moves the movent, or the movent is itself responsible for the motion. Further, in the latter case, either the movent immediately precedes the last thing in the series, or there may be one or more intermediate links: e.g. the stick moves the stone and is moved by the hand, which again is moved by the man: in the man, however, we have reached a movent that is not so in virtue of being moved by something else. Now we say that the thing is moved both by the last and by the first movent in the series, but more strictly by the first, since the first movent moves the last, whereas the last does not move the first, and the first will move the thing without the last, but the last will not move it without the first: e.g. the stick will not move anything unless it is itself moved by the man. If then everything that is in motion must be moved by something, and the movent must either itself be moved by something else or not, and in the former case there must be some first movent that is not itself moved by anything else, while in the case of the immediate movent being of this kind there is no need of an intermediate movent that is also moved (for it is impossible that there should be an infinite series of

movents, each of which is itself moved by something else, since in an infinite series there is no first term) – if then everything that is in motion is moved by something, and the first movent is moved but not by anything else, it much be moved by itself.

This same argument may also be stated in another way as follows. Every movent moves something and moves it with something, either with itself or with something else: e.g. a man moves a thing either himself or with a stick, and a thing is knocked down either by the wind itself or by a stone propelled by the wind. But it is impossible for that with which a thing is moved to move it without being moved by that which imparts motion by its own agency: on the other hand, if a thing imparts motion by its own agency, it is not necessary that there should be anything else with which it imparts motion, whereas if there is a different thing with which it imparts motion, there must be something that imparts motion not with something else but with itself, or else there will be an infinite series. If, then, anything is a movent while being itself moved, the series must stop somewhere and not be infinite. Thus, if the stick moves something in virtue of being moved by the hand, the hand moves the stick: and if something else moves with the hand, the hand also is moved by something different from itself. So when motion by means of an instrument is at each stage caused by something different from the instrument, this must always be preceded by something else which imparts motion with itself. Therefore, if this last movent is in motion and there is nothing else that moves it, it must move itself. So this reasoning also shows that when a thing is moved, if it is not moved immediately by something that moves itself, the series brings us at some time or other to a movent of this kind.

And if we consider the matter in yet a third wa Ly we shall get this same result as follows. If everything that is in motion is moved by something that is in motion, ether this being in

motion is an accidental attribute of the movents in question, so that each of them moves something while being itself in motion, but not always because it is itself in motion, or it is not accidental but an essential attribute. Let us consider the former alternative. If then it is an accidental attribute, it is not necessary that that is in motion should be in motion: and if this is so it is clear that there may be a time when nothing that exists is in motion, since the accidental is not necessary but contingent. Now if we assume the existence of a possibility, any conclusion that we thereby reach will not be an impossibility though it may be contrary to fact. But the nonexistence of motion is an impossibility: for we have shown above that there must always be motion.

Moreover, the conclusion to which we have been led is a reasonable one. For there must be three things – the moved, the movent, and the instrument of motion. Now the moved must be in motion, but it need not move anything else: the instrument of motion must both move something else and be itself in motion (for it changes together with the moved, with which it is in contact and continuous, as is clear in the case of things that move other things locally, in which case the two things must up to a certain point be in contact): and the movent – that is to say, that which causes motion in such a manner that it is not merely the instrument of motion – must be unmoved. Now we have visual experience of the last term in this series, namely that which has the capacity of being in motion, but does not contain a motive principle, and also of that which is in motion but is moved by itself and not by anything else: it is reasonable, therefore, not to say necessary, to suppose the existence of the third term also, that which causes motion but is itself unmoved. So, too, Anaxagoras is right when he says that Mind is impassive and unmixed, since he makes it the principle of motion: for it could cause motion in this sense only by being itself unmoved, and have supreme control only by being unmixed.

We will now take the second alternative. If the movement is not accidentally but necessarily in motion – so that, if it were not in motion, it would not move anything – then the movent, in so far as it is in motion, must be in motion in one of two ways: it is moved either as that is which is moved with the same kind of motion, or with a different kind – either that which is heating, I mean, is itself in process of becoming hot, that which is making healthy in process of becoming healthy, and that which is causing locomotion in process of locomotion, or else that which is making healthy is, let us say, in process of locomotion, and that which is causing locomotion in process of, say, increase. But it is evident that this is impossible. For if we adopt the first assumption we have to make it apply within each of the very lowest species into which motion can be divided: e.g. we must say that if some one is teaching some lesson in geometry, he is also in process of being taught that same lesson in geometry, and that if he is throwing he is in process of being thrown in just the same manner. Or if we reject this assumption we must say that one kind of motion is derived from another; e.g. that that which is causing locomotion is in process of increase, that which is causing this increase is in process of being altered by something else, and that which is causing this alteration is in process of suffering some different kind of motion. But the series must stop somewhere, since the kinds of motion are limited; and if we say that the process is reversible, and that that which is causing alteration is in process of locomotion, we do no more than if we had said at the outset that that which is causing locomotion is in process of locomotion, and that one who is teaching is in process of being taught: for it is clear that everything that is moved is moved by the movent that is further back in the series as well as by that which immediately moves it: in fact the earlier movent is that which more strictly moves it. But this is of course impossible: for it involves the consequence that one who is teaching is in process of learning

what he is teaching, whereas teaching necessarily implies possessing knowledge, and learning not possessing it. Still more unreasonable is the consequence involved that, since everything that is moved is moved by something that is itself moved by something else, everything that has a capacity for causing motion has as such a corresponding capacity for being moved: i.e. it will have a capacity for being moved in the sense in which one might say that everything that has a capacity for making healthy, and exercises that capacity, has as such a capacity for being made healthy, and that which has a capacity for building has as such a capacity for being built. It will have the capacity for being thus moved either immediately or through one or more links (as it will if, while everything that has a capacity for causing motion has as such a capacity for being moved by something else, the motion that it has the capacity for suffering is not that with which it affects what is next to it, but a motion of a different kind; e.g. that which has a capacity for making healthy might as such have a capacity for learn. the series, however, could be traced back, as we said before, until at some time or other we arrived at the same kind of motion). Now the first alternative is impossible, and the second is fantastic: it is absurd that that which has a capacity for causing alteration should as such necessarily have a capacity, let us say, for increase. It is not necessary, therefore, that that which is moved should always be moved by something else that is itself moved by something else: so there will be an end to the series. Consequently the first thing that is in motion will derive its motion either from something that is at rest or from itself. But if there were any need to consider which of the two, that which moves itself or that which is moved by something else, is the cause and principle of motion, every one would decide the former: for that which is itself independently a cause is always prior as a cause to that which is so only in

virtue of being itself dependent upon something else that makes it so.

We must therefore make a fresh start and consider the question; if a thing moves itself, in what sense and in what manner does it do so? Now everything that is in motion must be infinitely divisible, for it has been shown already in our general course on Physics, that everything that is essentially in motion is continuous. Now it is impossible that that which moves itself should in its entirety move itself: for then, while being specifically one and indivisible, it would as a Whole both undergo and cause the same locomotion or alteration: thus it would at the same time be both teaching and being taught (the same thing), or both restoring to and being restored to the same health. Moreover, we have established the fact that it is the movable that is moved; and this is potentially, not actually, in motion, but the potential is in process to actuality, and motion is an incomplete actuality of the movable. The movent on the other hand is already in activity: e.g. it is that which is hot that produces heat: in fact, that which produces the form is always something that possesses it. Consequently (if a thing can move itself as a whole), the same thing in respect of the same thing may be at the same time both hot and not hot. So, too, in every other case where the movent must be described by the same name in the same sense as the moved. Therefore when a thing moves itself it is one part of it that is the movent and another part that is moved. But it is not self-moving in the sense that each of the two parts is moved by the other part: the following considerations make this evident. In the first place, if each of the two parts is to move the other, there will be no first movent. If a thing is moved by a series of movents, that which is earlier in the series is more the cause of its being moved than that which comes next, and will be more truly the movent: for we found that there are two kinds of movent, that which is itself moved by something else and that which derives its motion

from itself: and that which is further from the thing that is moved is nearer to the principle of motion than that which is intermediate. In the second place, there is no necessity for the movent part to be moved by anything but itself: so it can only be accidentally that the other part moves it in return. I take then the possible case of its not moving it: then there will be a part that is moved and a part that is an unmoved movent. In the third place, there is no necessity for the movent to be moved in return: on the contrary the necessity that there should always be motion makes it necessary that there should be some movent that is either unmoved or moved by itself. In the fourth place we should then have a thing undergoing the same motion that it is causing – that which is producing heat, therefore, being heated. But as a matter of fact that which primarily moves itself cannot contain either a single part that moves itself or a number of parts each of which moves itself. For, if the whole is moved by itself, it must be moved either by some part of itself or as a whole by itself as a whole. If, then, it is moved in virtue of some part of it being moved by that part itself, it is this part that will be the primary self-movent, since, if this part is separated from the whole, the part will still move itself, but the whole will do so no longer. If on the other hand the whole is moved by itself as a whole, it must be accidentally that the parts move themselves: and therefore, their self-motion not being necessary, we may take the case of their not being moved by themselves. Therefore in the whole of the thing we may distinguish that which imparts motion without itself being moved and that which is moved: for only in this way is it possible for a thing to be self-moved. Further, if the whole moves itself we may distinguish in it that which imparts the motion and that which is moved: so while we say that AB is moved by itself, we may also say that it is moved by A. And since that which imparts motion may be either a thing that is moved by something else or a thing that is unmoved, and that

which is moved may be either a thing that imparts motion to something else or a thing that does not, that which moves itself must be composed of something that is unmoved but imparts motion and also of something that is moved but does not necessarily impart motion but may or may not do so. Thus let A be something that imparts motion but is unmoved, B something that is moved by A and moves G, G something that is moved by B but moves nothing (granted that we eventually arrive at G we may take it that there is only one intermediate term, though there may be more). Then the whole ABG moves itself. But if I take away G, AB will move itself, A imparting motion and B being moved, whereas G will not move itself or in fact be moved at all. Nor again will BG move itself apart from A: for B imparts motion only through being moved by something else, not through being moved by any part of itself. So only AB moves itself. That which moves itself, therefore, must comprise something that imparts motion but is unmoved and something that is moved but does not necessarily move anything else: and each of these two things, or at any rate one of them, must be in contact with the other. If, then, that which imparts motion is a continuous substance – that which is moved must of course be so – it is clear that it is not through some part of the whole being of such a nature as to be capable of moving itself that the whole moves itself: it moves itself as a whole, both being moved and imparting motion through containing a part that imparts motion and a part that is moved. It does not impart motion as a whole nor is it moved as a whole: it is A alone that imparts motion and B alone that is moved. It is not true, further, that G is moved by A, which is impossible.

Here a difficulty arises: if something is taken away from A (supposing that that which imparts motion but is unmoved is a continuous substance), or from B the part that is moved, will the remainder of A continue to impart motion or the remainder of B continue to be moved? If so, it will not be AB primarily that is

moved by itself, since, when something is taken away from AB, the remainder of AB will still continue to move itself. Perhaps we may state the case thus: there is nothing to prevent each of the two parts, or at any rate one of them, that which is moved, being divisible though actually undivided, so that if it is divided it will not continue in the possession of the same capacity: and so there is nothing to prevent self-motion residing primarily in things that are potentially divisible.

From what has been said, then, it is evident that that which primarily imparts motion is unmoved: for, whether the series is closed at once by that which is in motion but moved by something else deriving its motion directly from the first unmoved, or whether the motion is derived from what is in motion but moves itself and stops its own motion, on both suppositions we have the result that in all cases of things being in motion that which primarily imparts motion is unmoved.

6

Since there must always be motion without intermission, there must necessarily be something, one thing or it may be a plurality, that first imparts motion, and this first movent must be unmoved. Now the question whether each of the things that are unmoved but impart motion is eternal is irrelevant to our present argument: but the following considerations will make it clear that there must necessarily be some such thing, which, while it has the capacity of moving something else, is itself unmoved and exempt from all change, which can affect it neither in an unqualified nor in an accidental sense. Let us suppose, if any one likes, that in the case of certain things it is possible for them at different times to be and not to be, without

any process of becoming and perishing (in fact it would seem to be necessary, if a thing that has not parts at one time is and at another time is not, that any such thing should without undergoing any process of change at one time be and at another time not be). And let us further suppose it possible that some principles that are unmoved but capable of imparting motion at one time are and at another time are not. Even so, this cannot be true of all such principles, since there must clearly be something that causes things that move themselves at one time to be and at another not to be. For, since nothing that has not parts can be in motion, that which moves itself must as a whole have magnitude, though nothing that we have said makes this necessarily true of every movent. So the fact that some things become and others perish, and that this is so continuously, cannot be caused by any one of those things that, though they are unmoved, do not always exist: nor again can it be caused by any of those which move certain particular things, while others move other things. The eternity and continuity of the process cannot be caused either by any one of them singly or by the sum of them, because this causal relation must be eternal and necessary, whereas the sum of these movents is infinite and they do not all exist together. It is clear, then, that though there may be countless instances of the perishing of some principles that are unmoved but impart motion, and though many things that move themselves perish and are succeeded by others that come into being, and though one thing that is unmoved moves one thing while another moves another, nevertheless there is something that comprehends them all, and that as something apart from each one of them, and this it is that is the cause of the fact that some things are and others are not and of the continuous process of change: and this causes the motion of the other movents, while they are the causes of the motion of other things. Motion, then, being eternal, the first movent, if there is but one, will be eternal also: if there are more than one,

there will be a plurality of such eternal movents. We ought, however, to suppose that there is one rather than many, and a finite rather than an infinite number. When the consequences of either assumption are the same, we should always assume that things are finite rather than infinite in number, since in things constituted by nature that which is finite and that which is better ought, if possible, to be present rather than the reverse: and here it is sufficient to assume only one movent, the first of unmoved things, which being eternal will be the principle of motion to everything else.

The following argument also makes it evident that the first movent must be something that is one and eternal. We have shown that there must always be motion. That being so, motion must also be continuous, because what is always is continuous, whereas what is merely in succession is not continuous. But further, if motion is continuous, it is one: and it is one only if the movent and the moved that constitute it are each of them one, since in the event of a thing's being moved now by one thing and now by another the whole motion will not be continuous but successive.

Moreover a conviction that there is a first unmoved something may be reached not only from the foregoing arguments, but also by considering again the principles operative in movents. Now it is evident that among existing things there are some that are sometimes in motion and sometimes at rest. This fact has served above to make it clear that it is not true either that all things are in motion or that all things are at rest or that some things are always at rest and the remainder always in motion: on this matter proof is supplied by things that fluctuate between the two and have the capacity of being sometimes in motion and sometimes at rest. The existence of things of this kind is clear to all: but we wish to explain also the nature of each of the other two kinds and show that there are some

things that are always unmoved and some things that are always in motion. In the course of our argument directed to this end we established the fact that everything that is in motion is moved by something, and that the movent is either unmoved or in motion, and that, if it is in motion, it is moved either by itself or by something else and so on throughout the series: and so we proceeded to the position that the first principle that directly causes things that are in motion to be moved is that which moves itself, and the first principle of the whole series is the unmoved. Further it is evident from actual observation that there are things that have the characteristic of moving themselves, e.g. the animal kingdom and the whole class of living things. This being so, then, the view was suggested that perhaps it may be possible for motion to come to be in a thing without having been in existence at all before, because we see this actually occurring in animals: they are unmoved at one time and then again they are in motion, as it seems. We must grasp the fact, therefore, that animals move themselves only with one kind of motion, and that this is not strictly originated by them. The cause of it is not derived from the animal itself: it is connected with other natural motions in animals, which they do not experience through their own instrumentality, e.g. increase, decrease, and respiration: these are experienced by every animal while it is at rest and not in motion in respect of the motion set up by its own agency: here the motion is caused by the atmosphere and by many things that enter into the animal: thus in some cases the cause is nourishment: when it is being digested animals sleep, and when it is being distributed through the system they awake and move themselves, the first principle of this motion being thus originally derived from outside. Therefore animals are not always in continuous motion by their own agency: it is something else that moves them, itself being in motion and changing as it comes into relation with each several thing that moves itself. (Moreover in all these self-

moving things the first movent and cause of their self-motion is itself moved by itself, though in an accidental sense: that is to say, the body changes its place, so that that which is in the body changes its place also and is a self-movent through its exercise of leverage.) Hence we may confidently conclude that if a thing belongs to the class of unmoved movents that are also themselves moved accidentally, it is impossible that it should cause continuous motion. So the necessity that there should be motion continuously requires that there should be a first movent that is unmoved even accidentally, if, as we have said, there is to be in the world of things an unceasing and undying motion, and the world is to remain permanently self-contained and within the same limits: for if the first principle is permanent, the universe must also be permanent, since it is continuous with the first principle. (We must distinguish, however, between accidental motion of a thing by itself and such motion by something else, the former being confined to perishable things, whereas the latter belongs also to certain first principles of heavenly bodies, of all those, that is to say, that experience more than one locomotion.)

And further, if there is always something of this nature, a movent that is itself unmoved and eternal, then that which is first moved by it must be eternal. Indeed this is clear also from the consideration that there would otherwise be no becoming and perishing and no change of any kind in other things, which require something that is in motion to move them: for the motion imparted by the unmoved will always be imparted in the same way and be one and the same, since the unmoved does not itself change in relation to that which is moved by it. But that which is moved by something that, though it is in motion, is moved directly by the unmoved stands in varying relations to the things that it moves, so that the motion that it causes will not be always the same: by reason of the fact that it occupies contrary positions or assumes contrary forms at

different times it will produce contrary motions in each several thing that it moves and will cause it to be at one time at rest and at another time in motion.

The foregoing argument, then, has served to clear up the point about which we raised a difficulty at the outset – why is it that instead of all things being either in motion or at rest, or some things being always in motion and the remainder always at rest, there are things that are sometimes in motion and sometimes not? The cause of this is now plain: it is because, while some things are moved by an eternal unmoved movent and are therefore always in motion, other things are moved by a movent that is in motion and changing, so that they too must change. But the unmoved movent, as has been said, since it remains permanently simple and unvarying and in the same state, will cause motion that is one and simple.

7

This matter will be made clearer, however, if we start afresh from another point. We must consider whether it is or is not possible that there should be a continuous motion, and, if it is possible, which this motion is, and which is the primary motion: for it is plain that if there must always be motion, and a particular motion is primary and continuous, then it is this motion that is imparted by the first movent, and so it is necessarily one and the same and continuous and primary.

Now of the three kinds of motion that there are – motion in respect of magnitude, motion in respect of affection, and motion in respect of place – it is this last, which we call locomotion, that must be primary. This may be shown as follows. It is impossible that there should be increase without

the previous occurrence of alteration: for that which is increased, although in a sense it is increased by what is like itself, is in a sense increased by what is unlike itself: thus it is said that contrary is nourishment to contrary: but growth is effected only by things becoming like to like. There must be alteration, then, in that there is this change from contrary to contrary. But the fact that a thing is altered requires that there should be something that alters it, something e.g. that makes the potentially hot into the actually hot: so it is plain that the movent does not maintain a uniform relation to it but is at one time nearer to and at another farther from that which is altered: and we cannot have this without locomotion. If, therefore, there must always be motion, there must also always be locomotion as the primary motion, and, if there is a primary as distinguished from a secondary form of locomotion, it must be the primary form. Again, all affections have their origin in condensation and rarefaction: thus heavy and light, soft and hard, hot and cold, are considered to be forms of density and rarity. But condensation and rarefaction are nothing more than combination and separation, processes in accordance with which substances are said to become and perish: and in being combined and separated things must change in respect of place. And further, when a thing is increased or decreased its magnitude changes in respect of place.

Again, there is another point of view from which it will be clearly seen that locomotion is primary. As in the case of other things so too in the case of motion the word ‘primary’ may be used in several senses. A thing is said to be prior to other things when, if it does not exist, the others will not exist, whereas it can exist without the others: and there is also priority in time and priority in perfection of existence. Let us begin, then, with the first sense. Now there must be motion continuously, and there may be continuously either continuous motion or successive motion, the former, however, in a higher degree than

the latter: moreover it is better that it should be continuous rather than successive motion, and we always assume the presence in nature of the better, if it be possible: since, then, continuous motion is possible (this will be proved later: for the present let us take it for granted), and no other motion can be continuous except locomotion, locomotion must be primary. For there is no necessity for the subject of locomotion to be the subject either of increase or of alteration, nor need it become or perish: on the other hand there cannot be any one of these processes without the existence of the continuous motion imparted by the first movent.

Secondly, locomotion must be primary in time: for this is the only motion possible for things. It is true indeed that, in the case of any individual thing that has a becoming, locomotion must be the last of its motions: for after its becoming it first experiences alteration and increase, and locomotion is a motion that belongs to such things only when they are perfected. But there must previously be something else that is in process of locomotion to be the cause even of the becoming of things that become, without itself being in process of becoming, as e.g. the begotten is preceded by what begot it: otherwise becoming might be thought to be the primary motion on the ground that the thing must first become. But though this is so in the case of any individual thing that becomes, nevertheless before anything becomes, something else must be in motion, not itself becoming but being, and before this there must again be something else. And since becoming cannot be primary – for, if it were, everything that is in motion would be perishable – it is plain that no one of the motions next in order can be prior to locomotion. By the motions next in order I mean increase and then alteration, decrease, and perishing. All these are posterior to becoming: consequently, if not even becoming is prior to locomotion, then no one of the other processes of change is so either.

Thirdly, that which is in process of becoming appears universally as something imperfect and proceeding to a first principle: and so what is posterior in the order of becoming is prior in the order of nature. Now all things that go through the process of becoming acquire locomotion last. It is this that accounts for the fact that some living things, e.g. plants and many kinds of animals, owing to lack of the requisite organ, are entirely without motion, whereas others acquire it in the course of their being perfected. Therefore, if the degree in which things possess locomotion corresponds to the degree in which they have realized their natural development, then this motion must be prior to all others in respect of perfection of existence: and not only for this reason but also because a thing that is in motion loses its essential character less in the process of locomotion than in any other kind of motion: it is the only motion that does not involve a change of being in the sense in which there is a change in quality when a thing is altered and a change in quantity when a thing is increased or decreased. Above all it is plain that this motion, motion in respect of place, is what is in the strictest sense produced by that which moves itself; but it is the self-movent that we declare to be the first principle of things that are moved and impart motion and the primary source to which things that are in motion are to be referred.

It is clear, then, from the foregoing arguments that locomotion is the primary motion. We have now to show which kind of locomotion is primary. The same process of reasoning will also make clear at the same time the truth of the assumption we have made both now and at a previous stage that it is possible that there should be a motion that is continuous and eternal. Now it is clear from the following considerations that no other than locomotion can be continuous. Every other motion and change is from an opposite to an opposite: thus for the processes of becoming and perishing the limits are the existent

and the non-existent, for alteration the various pairs of contrary affections, and for increase and decrease either greatness and smallness or perfection and imperfection of magnitude: and changes to the respective contraries are contrary changes. Now a thing that is undergoing any particular kind of motion, but though previously existent has not always undergone it, must previously have been at rest so far as that motion is concerned. It is clear, then, that for the changing thing the contraries will be states of rest. And we have a similar result in the case of changes that are not motions: for becoming and perishing, whether regarded simply as such without qualification or as affecting something in particular, are opposites: therefore provided it is impossible for a thing to undergo opposite changes at the same time, the change will not be continuous, but a period of time will intervene between the opposite processes. The question whether these contradictory changes are contraries or not makes no difference, provided only it is impossible for them both to be present to the same thing at the same time: the point is of no importance to the argument. Nor does it matter if the thing need not rest in the contradictory state, or if there is no state of rest as a contrary to the process of change: it may be true that the non-existent is not at rest, and that perishing is a process to the non-existent. All that matters is the intervention of a time: it is this that prevents the change from being continuous: so, too, in our previous instances the important thing was not the relation of contrariety but the impossibility of the two processes being present to a thing at the same time. And there is no need to be disturbed by the fact that on this showing there may be more than one contrary to the same thing, that a particular motion will be contrary both to rest and to motion in the contrary direction. We have only to grasp the fact that a particular motion is in a sense the opposite both of a state of rest and of the contrary motion, in the same way as that which is of equal or standard measure is the

opposite both of that which surpasses it and of that which it surpasses, and that it is impossible for the opposite motions or changes to be present to a thing at the same time. Furthermore, in the case of becoming and perishing it would seem to be an utterly absurd thing if as soon as anything has become it must necessarily perish and cannot continue to exist for any time: and, if this is true of becoming and perishing, we have fair grounds for inferring the same to be true of the other kinds of change, since it would be in the natural order of things that they should be uniform in this respect.

8

Let us now proceed to maintain that it is possible that there should be an infinite motion that is single and continuous, and that this motion is rotatory motion. The motion of everything that is in process of locomotion is either rotatory or rectilinear or a compound of the two: consequently, if one of the former two is not continuous, that which is composed of them both cannot be continuous either. Now it is plain that if the locomotion of a thing is rectilinear and finite it is not continuous locomotion: for the thing must turn back, and that which turns back in a straight line undergoes two contrary locomotions, since, so far as motion in respect of place is concerned, upward motion is the contrary of downward motion, forward motion of backward motion, and motion to the left of motion to the right, these being the pairs of contraries in the sphere of place. But we have already defined single and continuous motion to be motion of a single thing in a single period of time and operating within a sphere admitting of no further specific differentiation (for we have three things to consider, first that which is in motion, e.g. a man or a god,

secondly the ‘when’ of the motion, that is to say, the time, and thirdly the sphere within which it operates, which may be either place or affection or essential form or magnitude): and contraries are specifically not one and the same but distinct: and within the sphere of place we have the above-mentioned distinctions. Moreover we have an indication that motion from A to B is the contrary of motion from B to A in the fact that, if they occur at the same time, they arrest and stop each other. And the same is true in the case of a circle: the motion from A towards B is the contrary of the motion from A towards G: for even if they are continuous and there is no turning back they arrest each other, because contraries annihilate or obstruct one another. On the other hand lateral motion is not the contrary of upward motion. But what shows most clearly that rectilinear motion cannot be continuous is the fact that turning back necessarily implies coming to a stand, not only when it is a straight line that is traversed, but also in the case of locomotion in a circle (which is not the same thing as rotatory locomotion: for, when a thing merely traverses a circle, it may either proceed on its course without a break or turn back again when it has reached the same point from which it started). We may assure ourselves of the necessity of this coming to a stand not only on the strength of observation, but also on theoretical grounds. We may start as follows: we have three points, starting-point, middle-point, and finishing-point, of which the middle-point in virtue of the relations in which it stands severally to the other two is both a starting-point and a finishing-point, and though numerically one is theoretically two. We have further the distinction between the potential and the actual. So in the straight line in question any one of the points lying between the two extremes is potentially a middle-point: but it is not actually so unless that which is in motion divides the line by coming to a stand at that point and beginning its motion again: thus the middle-point becomes both a starting-point and a goal, the

starting-point of the latter part and the finishing-point of the first part of the motion. This is the case e.g. when A in the course of its locomotion comes to a stand at B and starts again towards G: but when its motion is continuous A cannot either have come to be or have ceased to be at the point B: it can only have been there at the moment of passing, its passage not being contained within any period of time except the whole of which the particular moment is a dividing-point. To maintain that it has come to be and ceased to be there will involve the consequence that A in the course of its locomotion will always be coming to a stand: for it is impossible that A should simultaneously have come to be at B and ceased to be there, so that the two things must have happened at different points of time, and therefore there will be the intervening period of time: consequently A will be in a state of rest at B, and similarly at all other points, since the same reasoning holds good in every case. When to A, that which is in process of locomotion, B, the middle-point, serves both as a finishing-point and as a starting-point for its motion, A must come to a stand at B, because it makes it two just as one might do in thought. However, the point A is the real starting-point at which the moving body has ceased to be, and it is at G that it has really come to be when its course is finished and it comes to a stand. So this is how we must meet the difficulty that then arises, which is as follows. Suppose the line E is equal to the line Z, that A proceeds in continuous locomotion from the extreme point of E to G, and that, at the moment when A is at the point B, D is proceeding in uniform locomotion and with the same velocity as A from the extremity of Z to H: then, says the argument, D will have reached H before A has reached G for that which makes an earlier start and departure must make an earlier arrival: the reason, then, for the late arrival of A is that it has not simultaneously come to be and ceased to be at B: otherwise it will not arrive later: for this to happen it will be necessary that

it should come to a stand there. Therefore we must not hold that there was a moment when A came to be at B and that at the same moment D was in motion from the extremity of Z: for the fact of A's having come to be at B will involve the fact of its also ceasing to be there, and the two events will not be simultaneous, whereas the truth is that A is at B at a sectional point of time and does not occupy time there. In this case, therefore, where the motion of a thing is continuous, it is impossible to use this form of expression. On the other hand in the case of a thing that turns back in its course we must do so. For suppose H in the course of its locomotion proceeds to D and then turns back and proceeds downwards again: then the extreme point D has served as finishing-point and as starting-point for it, one point thus serving as two: therefore H must have come to a stand there: it cannot have come to be at D and departed from D simultaneously, for in that case it would simultaneously be there and not be there at the same moment. And here we cannot apply the argument used to solve the difficulty stated above: we cannot argue that H is at D at a sectional point of time and has not come to be or ceased to be there. For here the goal that is reached is necessarily one that is actually, not potentially, existent. Now the point in the middle is potential: but this one is actual, and regarded from below it is a finishing-point, while regarded from above it is a starting-point, so that it stands in these same two respective relations to the two motions. Therefore that which turns back in traversing a rectilinear course must in so doing come to a stand. Consequently there cannot be a continuous rectilinear motion that is eternal.

The same method should also be adopted in replying to those who ask, in the terms of Zeno's argument, whether we admit that before any distance can be traversed half the distance must be traversed, that these half-distances are infinite in number, and that it is impossible to traverse distances infinite in number

– or some on the lines of this same argument put the questions in another form, and would have us grant that in the time during which a motion is in progress it should be possible to reckon a half-motion before the whole for every half-distance that we get, so that we have the result that when the whole distance is traversed we have reckoned an infinite number, which is admittedly impossible. Now when we first discussed the question of motion we put forward a solution of this difficulty turning on the fact that the period of time occupied in traversing the distance contains within itself an infinite number of units: there is no absurdity, we said, in supposing the traversing of infinite distances in infinite time, and the element of infinity is present in the time no less than in the distance. But, although this solution is adequate as a reply to the questioner (the question asked being whether it is possible in a finite time to traverse or reckon an infinite number of units), nevertheless as an account of the fact and explanation of its true nature it is inadequate. For suppose the distance to be left out of account and the question asked to be no longer whether it is possible in a finite time to traverse an infinite number of distances, and suppose that the inquiry is made to refer to the time taken by itself (for the time contains an infinite number of divisions): then this solution will no longer be adequate, and we must apply the truth that we enunciated in our recent discussion, stating it in the following way. In the act of dividing the continuous distance into two halves one point is treated as two, since we make it a starting-point and a finishing-point: and this same result is also produced by the act of reckoning halves as well as by the act of dividing into halves. But if divisions are made in this way, neither the distance nor the motion will be continuous: for motion if it is to be continuous must relate to what is continuous: and though what is continuous contains an infinite number of halves, they are not actual but potential halves. If the halves are made actual, we

shall get not a continuous but an intermittent motion. In the case of reckoning the halves, it is clear that this result follows: for then one point must be reckoned as two: it will be the finishing-point of the one half and the starting-point of the other, if we reckon not the one continuous whole but the two halves. Therefore to the question whether it is possible to pass through an infinite number of units either of time or of distance we must reply that in a sense it is and in a sense it is not. If the units are actual, it is not possible: if they are potential, it is possible. For in the course of a continuous motion the traveller has traversed an infinite number of units in an accidental sense but not in an unqualified sense: for though it is an accidental characteristic of the distance to be an infinite number of half-distances, this is not its real and essential character. It is also plain that unless we hold that the point of time that divides earlier from later always belongs only to the later so far as the thing is concerned, we shall be involved in the consequence that the same thing is at the same moment existent and not existent, and that a thing is not existent at the moment when it has become. It is true that the point is common to both times, the earlier as well as the later, and that, while numerically one and the same, it is theoretically not so, being the finishing-point of the one and the starting-point of the other: but so far as the thing is concerned it belongs to the later stage of what happens to it. Let us suppose a time ABG and a thing D, D being white in the time A and not-white in the time B. Then D is at the moment G white and not-white: for if we were right in saying that it is white during the whole time A, it is true to call it white at any moment of A, and not-white in B, and G is in both A and B. We must not allow, therefore, that it is white in the whole of A, but must say that it is so in all of it except the last moment G. G belongs already to the later period, and if in the whole of A not-white was in process of becoming and white of perishing, at G the process is complete. And so G is the first moment at

which it is true to call the thing white or not white respectively. Otherwise a thing may be non-existent at the moment when it has become and existent at the moment when it has perished: or else it must be possible for a thing at the same time to be white and not white and in fact to be existent and non-existent. Further, if anything that exists after having been previously non-existent must become existent and does not exist when it is becoming, time cannot be divisible into time-atoms. For suppose that D was becoming white in the time A and that at another time B, a time-atom consecutive with the last atom of A, D has already become white and so is white at that moment: then, inasmuch as in the time A it was becoming white and so was not white and at the moment B it is white, there must have been a becoming between A and B and therefore also a time in which the becoming took place. On the other hand, those who deny atoms of time (as we do) are not affected by this argument: according to them D has become and so is white at the last point of the actual time in which it was becoming white: and this point has no other point consecutive with or in succession to it, whereas time-atoms are conceived as successive. Moreover it is clear that if D was becoming white in the whole time A, the time occupied by it in having become white in addition to having been in process of becoming white is no more than all that it occupied in the mere process of becoming white.

These and such-like, then, are the arguments for our conclusion that derive cogency from the fact that they have a special bearing on the point at issue. If we look at the question from the point of view of general theory, the same result would also appear to be indicated by the following arguments. Everything whose motion is continuous must, on arriving at any point in the course of its locomotion, have been previously also in process of locomotion to that point, if it is not forced out of its path by anything: e.g. on arriving at B a thing must also have

been in process of locomotion to B, and that not merely when it was near to B, but from the moment of its starting on its course, since there can be, no reason for its being so at any particular stage rather than at an earlier one. So, too, in the case of the other kinds of motion. Now we are to suppose that a thing proceeds in locomotion from A to G and that at the moment of its arrival at G the continuity of its motion is unbroken and will remain so until it has arrived back at A. Then when it is undergoing locomotion from A to G it is at the same time undergoing also its locomotion to A from G: consequently it is simultaneously undergoing two contrary motions, since the two motions that follow the same straight line are contrary to each other. With this consequence there also follows another: we have a thing that is in process of change from a position in which it has not yet been: so, inasmuch as this is impossible, the thing must come to a stand at G. Therefore the motion is not a single motion, since motion that is interrupted by stationariness is not single.

Further, the following argument will serve better to make this point clear universally in respect of every kind of motion. If the motion undergone by that which is in motion is always one of those already enumerated, and the state of rest that it undergoes is one of those that are the opposites of the motions (for we found that there could be no other besides these), and moreover that which is undergoing but does not always undergo a particular motion (by this I mean one of the various specifically distinct motions, not some particular part of the whole motion) must have been previously undergoing the state of rest that is the opposite of the motion, the state of rest being privation of motion; then, inasmuch as the two motions that follow the same straight line are contrary motions, and it is impossible for a thing to undergo simultaneously two contrary motions, that which is undergoing locomotion from A to G cannot also simultaneously be undergoing locomotion from G

to A: and since the latter locomotion is not simultaneous with the former but is still to be undergone, before it is undergone there must occur a state of rest at G: for this, as we found, is the state of rest that is the opposite of the motion from G. The foregoing argument, then, makes it plain that the motion in question is not continuous.

Our next argument has a more special bearing than the foregoing on the point at issue. We will suppose that there has occurred in something simultaneously a perishing of not-white and a becoming of white. Then if the alteration to white and from white is a continuous process and the white does not remain any time, there must have occurred simultaneously a perishing of not-white, a becoming of white, and a becoming of not-white: for the time of the three will be the same.

Again, from the continuity of the time in which the motion takes place we cannot infer continuity in the motion, but only successiveness: in fact, how could contraries, e.g. whiteness and blackness, meet in the same extreme point?

On the other hand, in motion on a circular line we shall find singleness and continuity: for here we are met by no impossible consequence: that which is in motion from A will in virtue of the same direction of energy be simultaneously in motion to A (since it is in motion to the point at which it will finally arrive), and yet will not be undergoing two contrary or opposite motions: for a motion to a point and a motion from that point are not always contraries or opposites: they are contraries only if they are on the same straight line (for then they are contrary to one another in respect of place, as e.g. the two motions along the diameter of the circle, since the ends of this are at the greatest possible distance from one another), and they are opposites only if they are along the same line. Therefore in the case we are now considering there is nothing to prevent the

motion being continuous and free from all intermission: for rotatory motion is motion of a thing from its place to its place, whereas rectilinear motion is motion from its place to another place.

Moreover the progress of rotatory motion is never localized within certain fixed limits, whereas that of rectilinear motion repeatedly is so. Now a motion that is always shifting its ground from moment to moment can be continuous: but a motion that is repeatedly localized within certain fixed limits cannot be so, since then the same thing would have to undergo simultaneously two opposite motions. So, too, there cannot be continuous motion in a semicircle or in any other arc of a circle, since here also the same ground must be traversed repeatedly and two contrary processes of change must occur. The reason is that in these motions the starting-point and the termination do not coincide, whereas in motion over a circle they do coincide, and so this is the only perfect motion.

This differentiation also provides another means of showing that the other kinds of motion cannot be continuous either: for in all of them we find that there is the same ground to be traversed repeatedly; thus in alteration there are the intermediate stages of the process, and in quantitative change there are the intervening degrees of magnitude: and in becoming and perishing the same thing is true. It makes no difference whether we take the intermediate stages of the process to be few or many, or whether we add or subtract one: for in either case we find that there is still the same ground to be traversed repeatedly. Moreover it is plain from what has been said that those physicists who assert that all sensible things are always in motion are wrong: for their motion must be one or other of the motions just mentioned: in fact they mostly conceive it as alteration (things are always in flux and decay, they say), and they go so far as to speak even of becoming and

perishing as a process of alteration. On the other hand, our argument has enabled us to assert the fact, applying universally to all motions, that no motion admits of continuity except rotatory motion: consequently neither alteration nor increase admits of continuity. We need now say no more in support of the position that there is no process of change that admits of infinity or continuity except rotatory locomotion.

9

It can now be shown plainly that rotation is the primary locomotion. Every locomotion, as we said before, is either rotatory or rectilinear or a compound of the two: and the two former must be prior to the last, since they are the elements of which the latter consists. Moreover rotatory locomotion is prior to rectilinear locomotion, because it is more simple and complete, which may be shown as follows. The straight line traversed in rectilinear motion cannot be infinite: for there is no such thing as an infinite straight line; and even if there were, it would not be traversed by anything in motion: for the impossible does not happen and it is impossible to traverse an infinite distance. On the other hand rectilinear motion on a finite straight line is if it turns back a composite motion, in fact two motions, while if it does not turn back it is incomplete and perishable: and in the order of nature, of definition, and of time alike the complete is prior to the incomplete and the imperishable to the perishable. Again, a motion that admits of being eternal is prior to one that does not. Now rotatory motion can be eternal: but no other motion, whether locomotion or motion of any other kind, can be so, since in all of them rest must occur and with the occurrence of rest the motion has perished. Moreover the result at which we have arrived, that

rotatory motion is single and continuous, and rectilinear motion is not, is a reasonable one. In rectilinear motion we have a definite starting-point, finishing-point, middle-point, which all have their place in it in such a way that there is a point from which that which is in motion can be said to start and a point at which it can be said to finish its course (for when anything is at the limits of its course, whether at the starting-point or at the finishing-point, it must be in a state of rest). On the other hand in circular motion there are no such definite points: for why should any one point on the line be a limit rather than any other? Any one point as much as any other is alike starting-point, middle-point, and finishing-point, so that we can say of certain things both that they are always and that they never are at a starting-point and at a finishing-point (so that a revolving sphere, while it is in motion, is also in a sense at rest, for it continues to occupy the same place). The reason of this is that in this case all these characteristics belong to the centre: that is to say, the centre is alike starting-point, middle-point, and finishing-point of the space traversed; consequently since this point is not a point on the circular line, there is no point at which that which is in process of locomotion can be in a state of rest as having traversed its course, because in its locomotion it is proceeding always about a central point and not to an extreme point: therefore it remains still, and the whole is in a sense always at rest as well as continuously in motion. Our next point gives a convertible result: on the one hand, because rotation is the measure of motions it must be the primary motion (for all things are measured by what is primary): on the other hand, because rotation is the primary motion it is the measure of all other motions. Again, rotatory motion is also the only motion that admits of being regular. In rectilinear locomotion the motion of things in leaving the starting-point is not uniform with their motion in approaching the finishing-point, since the velocity of a thing always increases

proportionately as it removes itself farther from its position of rest: on the other hand rotatory motion is the only motion whose course is naturally such that it has no starting-point or finishing-point in itself but is determined from elsewhere.

As to locomotion being the primary motion, this is a truth that is attested by all who have ever made mention of motion in their theories: they all assign their first principles of motion to things that impart motion of this kind. Thus 'separation' and 'combination' are motions in respect of place, and the motion imparted by 'Love' and 'Strife' takes these forms, the latter 'separating' and the former 'combining'. Anaxagoras, too, says that 'Mind', his first movent, 'separates'. Similarly those who assert no cause of this kind but say that 'void' accounts for motion – they also hold that the motion of natural substance is motion in respect of place: for their motion that is accounted for by 'void' is locomotion, and its sphere of operation may be said to be place. Moreover they are of opinion that the primary substances are not subject to any of the other motions, though the things that are compounds of these substances are so subject: the processes of increase and decrease and alteration, they say, are effects of the 'combination' and 'separation' of atoms. It is the same, too, with those who make out that the becoming or perishing of a thing is accounted for by 'density' or 'rarity': for it is by 'combination' and 'separation' that the place of these things in their systems is determined. Moreover to these we may add those who make Soul the cause of motion: for they say that things that undergo motion have as their first principle 'that which moves itself': and when animals and all living things move themselves, the motion is motion in respect of place. Finally it is to be noted that we say that a thing 'is in motion' in the strict sense of the term only when its motion is motion in respect of place: if a thing is in process of increase or decrease or is undergoing some alteration while remaining at rest in the same place, we say that it is in motion in some

particular respect: we do not say that it 'is in motion' without qualification.

Our present position, then, is this: We have argued that there always was motion and always will be motion throughout all time, and we have explained what is the first principle of this eternal motion: we have explained further which is the primary motion and which is the only motion that can be eternal: and we have pronounced the first movent to be unmoved.

10

We have now to assert that the first movent must be without parts and without magnitude, beginning with the establishment of the premisses on which this conclusion depends.

One of these premisses is that nothing finite can cause motion during an infinite time. We have three things, the movent, the moved, and thirdly that in which the motion takes place, namely the time: and these are either all infinite or all finite or partly – that is to say two of them or one of them – finite and partly infinite. Let A be the movement, B the moved, and G the infinite time. Now let us suppose that D moves E, a part of B. Then the time occupied by this motion cannot be equal to G: for the greater the amount moved, the longer the time occupied. It follows that the time Z is not infinite. Now we see that by continuing to add to D, I shall use up A and by continuing to add to E, I shall use up B: but I shall not use up the time by continually subtracting a corresponding amount from it, because it is infinite. Consequently the duration of the part of G which is occupied by all A in moving the whole of B, will be finite. Therefore a finite thing cannot impart to anything an

infinite motion. It is clear, then, that it is impossible for the finite to cause motion during an infinite time.

It has now to be shown that in no case is it possible for an infinite force to reside in a finite magnitude. This can be shown as follows: we take it for granted that the greater force is always that which in less time than another does an equal amount of work when engaged in any activity – in heating, for example, or sweetening or throwing; in fact, in causing any kind of motion. Then that on which the forces act must be affected to some extent by our supposed finite magnitude possessing an infinite force as well as by anything else, in fact to a greater extent than by anything else, since the infinite force is greater than any other. But then there cannot be any time in which its action could take place. Suppose that A is the time occupied by the infinite power in the performance of an act of heating or pushing, and that AB is the time occupied by a finite power in the performance of the same act: then by adding to the latter another finite power and continually increasing the magnitude of the power so added I shall at some time or other reach a point at which the finite power has completed the motive act in the time A: for by continual addition to a finite magnitude I must arrive at a magnitude that exceeds any assigned limit, and in the same way by continual subtraction I must arrive at one that falls short of any assigned limit. So we get the result that the finite force will occupy the same amount of time in performing the motive act as the infinite force. But this is impossible. Therefore nothing finite can possess an infinite force. So it is also impossible for a finite force to reside in an infinite magnitude. It is true that a greater force can reside in a lesser magnitude: but the superiority of any such greater force can be still greater if the magnitude in which it resides is greater. Now let AB be an infinite magnitude. Then BG possesses a certain force that occupies a certain time, let us say the time Z in moving D. Now if I take a magnitude twice as great at BG, the

time occupied by this magnitude in moving D will be half of EZ (assuming this to be the proportion): so we may call this time ZH. That being so, by continually taking a greater magnitude in this way I shall never arrive at the full AB, whereas I shall always be getting a lesser fraction of the time given. Therefore the force must be infinite, since it exceeds any finite force. Moreover the time occupied by the action of any finite force must also be finite: for if a given force moves something in a certain time, a greater force will do so in a lesser time, but still a definite time, in inverse proportion. But a force must always be infinite – just as a number or a magnitude is – if it exceeds all definite limits. This point may also be proved in another way – by taking a finite magnitude in which there resides a force the same in kind as that which resides in the infinite magnitude, so that this force will be a measure of the finite force residing in the infinite magnitude.

It is plain, then, from the foregoing arguments that it is impossible for an infinite force to reside in a finite magnitude or for a finite force to reside in an infinite magnitude. But before proceeding to our conclusion it will be well to discuss a difficulty that arises in connexion with locomotion. If everything that is in motion with the exception of things that move themselves is moved by something else, how is it that some things, e.g. things thrown, continue to be in motion when their movent is no longer in contact with them? If we say that the movent in such cases moves something else at the same time, that the thrower e.g. also moves the air, and that this in being moved is also a movent, then it would be no more possible for this second thing than for the original thing to be in motion when the original movent is not in contact with it or moving it: all the things moved would have to be in motion simultaneously and also to have ceased simultaneously to be in motion when the original movent ceases to move them, even if, like the magnet, it makes that which it has moved capable of

being a movent. Therefore, while we must accept this explanation to the extent of saying that the original movent gives the power of being a movent either to air or to water or to something else of the kind, naturally adapted for imparting and undergoing motion, we must say further that this thing does not cease simultaneously to impart motion and to undergo motion: it ceases to be in motion at the moment when its movent ceases to move it, but it still remains a movent, and so it causes something else consecutive with it to be in motion, and of this again the same may be said. The motion begins to cease when the motive force produced in one member of the consecutive series is at each stage less than that possessed by the preceding member, and it finally ceases when one member no longer causes the next member to be a movent but only causes it to be in motion. The motion of these last two – of the one as movent and of the other as moved – must cease simultaneously, and with this the whole motion ceases. Now the things in which this motion is produced are things that admit of being sometimes in motion and sometimes at rest, and the motion is not continuous but only appears so: for it is motion of things that are either successive or in contact, there being not one movent but a number of movents consecutive with one another: and so motion of this kind takes place in air and water. Some say that it is 'mutual replacement': but we must recognize that the difficulty raised cannot be solved otherwise than in the way we have described. So far as they are affected by 'mutual replacement', all the members of the series are moved and impart motion simultaneously, so that their motions also cease simultaneously: but our present problem concerns the appearance of continuous motion in a single thing, and therefore, since it cannot be moved throughout its motion by the same movent, the question is, what moves it?

Resuming our main argument, we proceed from the positions that there must be continuous motion in the world of things,

that this is a single motion, that a single motion must be a motion of a magnitude (for that which is without magnitude cannot be in motion), and that the magnitude must be a single magnitude moved by a single movent (for otherwise there will not be continuous motion but a consecutive series of separate motions), and that if the movement is a single thing, it is either itself in motion or itself unmoved: if, then, it is in motion, it will have to be subject to the same conditions as that which it moves, that is to say it will itself be in process of change and in being so will also have to be moved by something: so we have a series that must come to an end, and a point will be reached at which motion is imparted by something that is unmoved. Thus we have a movent that has no need to change along with that which it moves but will be able to cause motion always (for the causing of motion under these conditions involves no effort): and this motion alone is regular, or at least it is so in a higher degree than any other, since the movent is never subject to any change. So, too, in order that the motion may continue to be of the same character, the moved must not be subject to change in respect of its relation to the movent. Moreover the movent must occupy either the centre or the circumference, since these are the first principles from which a sphere is derived. But the things nearest the movent are those whose motion is quickest, and in this case it is the motion of the circumference that is the quickest: therefore the movent occupies the circumference.

There is a further difficulty in supposing it to be possible for anything that is in motion to cause motion continuously and not merely in the way in which it is caused by something repeatedly pushing (in which case the continuity amounts to no more than successiveness). Such a movent must either itself continue to push or pull or perform both these actions, or else the action must be taken up by something else and be passed on from one movent to another (the process that we described before as occurring in the case of things thrown, since the air or

the water, being divisible, is a movent only in virtue of the fact that different parts of the air are moved one after another): and in either case the motion cannot be a single motion, but only a consecutive series of motions. The only continuous motion, then, is that which is caused by the unmoved movent: and this motion is continuous because the movent remains always invariable, so that its relation to that which it moves remains also invariable and continuous.

Now that these points are settled, it is clear that the first unmoved movent cannot have any magnitude. For if it has magnitude, this must be either a finite or an infinite magnitude. Now we have already'proved in our course on Physics that there cannot be an infinite magnitude: and we have now proved that it is impossible for a finite magnitude to have an infinite force, and also that it is impossible for a thing to be moved by a finite magnitude during an infinite time. But the first movent causes a motion that is eternal and does cause it during an infinite time. It is clear, therefore, that the first movent is indivisible and is without parts and without magnitude.

Aristotle - On the Heavens

[Translated by J. L. Stocks]

Book I

1

The science which has to do with nature clearly concerns itself for the most part with bodies and magnitudes and their properties and movements, but also with the principles of this sort of substance, as many as they may be. For of things constituted by nature some are bodies and magnitudes, some possess body and magnitude, and some are principles of things which possess these. Now a continuum is that which is divisible into parts always capable of subdivision, and a body is that which is every way divisible. A magnitude if divisible one way is a line, if two ways a surface, and if three a body. Beyond these there is no other magnitude, because the three dimensions are all that there are, and that which is divisible in three directions is divisible in all. For, as the Pythagoreans say, the world and all that is in it is determined by the number three, since beginning and middle and end give the number of an 'all', and the number they give is the triad. And so, having taken these three from nature as (so to speak) laws of it, we make further use of the number three in the worship of the Gods. Further, we use the terms in practice in this way. Of two things, or men, we say 'both', but not 'all': three is the first number to which the term 'all' has been appropriated. And in this, as we have said, we do but follow the lead which nature gives. Therefore, since 'every' and 'all' and 'complete' do not differ from one another in respect of form, but only, if at all, in their matter and in that to which they are applied, body alone among magnitudes can be complete. For it alone is determined by the three dimensions, that is, is an 'all'. But if it is divisible in three dimensions it is every way divisible, while the other magnitudes are divisible in one dimension or in two alone: for

the divisibility and continuity of magnitudes depend upon the number of the dimensions, one sort being continuous in one direction, another in two, another in all. All magnitudes, then, which are divisible are also continuous. Whether we can also say that whatever is continuous is divisible does not yet, on our present grounds, appear. One thing, however, is clear. We cannot pass beyond body to a further kind, as we passed from length to surface, and from surface to body. For if we could, it would cease to be true that body is complete magnitude. We could pass beyond it only in virtue of a defect in it; and that which is complete cannot be defective, since it has being in every respect. Now bodies which are classed as parts of the whole are each complete according to our formula, since each possesses every dimension. But each is determined relatively to that part which is next to it by contact, for which reason each of them is in a sense many bodies. But the whole of which they are parts must necessarily be complete, and thus, in accordance with the meaning of the word, have being, not in some respect only, but in every respect.

2

The question as to the nature of the whole, whether it is infinite in size or limited in its total mass, is a matter for subsequent inquiry. We will now speak of those parts of the whole which are specifically distinct. Let us take this as our starting-point. All natural bodies and magnitudes we hold to be, as such, capable of locomotion; for nature, we say, is their principle of movement. But all movement that is in place, all locomotion, as we term it, is either straight or circular or a combination of these two, which are the only simple movements. And the reason of this is that these two, the straight and the circular line, are the only simple magnitudes. Now revolution about the centre is circular motion, while the upward and downward movements are in a straight line, 'upward' meaning motion away from the centre, and 'downward' motion towards it. All simple motion, then, must be motion either away from or towards or about the centre. This seems to be in exact accord with what we said above:

as body found its completion in three dimensions, so its movement completes itself in three forms.

Bodies are either simple or compounded of such; and by simple bodies I mean those which possess a principle of movement in their own nature, such as fire and earth with their kinds, and whatever is akin to them. Necessarily, then, movements also will be either simple or in some sort compound – simple in the case of the simple bodies, compound in that of the composite – and in the latter case the motion will be that of the simple body which prevails in the composition. Supposing, then, that there is such a thing as simple movement, and that circular movement is an instance of it, and that both movement of a simple body is simple and simple movement is of a simple body (for if it is movement of a compound it will be in virtue of a prevailing simple element), then there must necessarily be some simple body which revolves naturally and in virtue of its own nature with a circular movement. By constraint, of course, it may be brought to move with the motion of something else different from itself, but it cannot so move naturally, since there is one sort of movement natural to each of the simple bodies. Again, if the unnatural movement is the contrary of the natural and a thing can have no more than one contrary, it will follow that circular movement, being a simple motion, must be unnatural, if it is not natural, to the body moved. If then (1) the body, whose movement is circular, is fire or some other element, its natural motion must be the contrary of the circular motion. But a single thing has a single contrary; and upward and downward motion are the contraries of one another. If, on the other hand, (2) the body moving with this circular motion which is unnatural to it is something different from the elements, there will be some other motion which is natural to it. But this cannot be. For if the natural motion is upward, it will be fire or air, and if downward, water or earth. Further, this circular motion is necessarily primary. For the perfect is naturally prior to the imperfect, and the circle is a perfect thing. This cannot be said of any straight line: – not of an infinite line; for, if it were perfect, it would have a limit and an end: nor of any finite line; for in every case there is something beyond it, since any finite line can be extended. And so, since the prior movement belongs to the body which naturally prior,

and circular movement is prior to straight, and movement in a straight line belongs to simple bodies – fire moving straight upward and earthy bodies straight downward towards the centre – since this is so, it follows that circular movement also must be the movement of some simple body. For the movement of composite bodies is, as we said, determined by that simple body which preponderates in the composition. These premises clearly give the conclusion that there is in nature some bodily substance other than the formations we know, prior to them all and more divine than they. But it may also be proved as follows. We may take it that all movement is either natural or unnatural, and that the movement which is unnatural to one body is natural to another – as, for instance, is the case with the upward and downward movements, which are natural and unnatural to fire and earth respectively. It necessarily follows that circular movement, being unnatural to these bodies, is the natural movement of some other. Further, if, on the one hand, circular movement is natural to something, it must surely be some simple and primary body which is ordained to move with a natural circular motion, as fire is ordained to fly up and earth down. If, on the other hand, the movement of the rotating bodies about the centre is unnatural, it would be remarkable and indeed quite inconceivable that this movement alone should be continuous and eternal, being nevertheless contrary to nature. At any rate the evidence of all other cases goes to show that it is the unnatural which quickest passes away. And so, if, as some say, the body so moved is fire, this movement is just as unnatural to it as downward movement; for any one can see that fire moves in a straight line away from the centre. On all these grounds, therefore, we may infer with confidence that there is something beyond the bodies that are about us on this earth, different and separate from them; and that the superior glory of its nature is proportionate to its distance from this world of ours.

3

In consequence of what has been said, in part by way of assumption and in part by way of proof, it is clear that not every body either possesses lightness or heaviness. As a preliminary we must explain in what sense we are using the words 'heavy' and 'light', sufficiently, at least, for our present purpose: we can examine the terms more closely later, when we come to consider their essential nature. Let us then apply the term 'heavy' to that which naturally moves towards the centre, and 'light' to that which moves naturally away from the centre. The heaviest thing will be that which sinks to the bottom of all things that move downward, and the lightest that which rises to the surface of everything that moves upward. Now, necessarily, everything which moves either up or down possesses lightness or heaviness or both – but not both relatively to the same thing: for things are heavy and light relatively to one another; air, for instance, is light relatively to water, and water light relatively to earth. The body, then, which moves in a circle cannot possibly possess either heaviness or lightness. For neither naturally nor unnaturally can it move either towards or away from the centre. Movement in a straight line certainly does not belong to it naturally, since one sort of movement is, as we saw, appropriate to each simple body, and so we should be compelled to identify it with one of the bodies which move in this way. Suppose, then, that the movement is unnatural. In that case, if it is the downward movement which is unnatural, the upward movement will be natural; and if it is the upward which is unnatural, the downward will be natural. For we decided that of contrary movements, if the one is unnatural to anything, the other will be natural to it. But since the natural movement of the whole and of its part of earth, for instance, as a whole and of a small clod – have one and the same direction, it results, in the first place, that this body can possess no lightness or heaviness at all (for that would mean that it could move by its own nature either from or towards the centre, which, as we know, is impossible); and, secondly, that it cannot possibly move in the way of locomotion by being forced violently aside in an upward or downward direction. For neither naturally nor unnaturally can it move with any other motion but its own, either

itself or any part of it, since the reasoning which applies to the whole applies also to the part.

It is equally reasonable to assume that this body will be ungenerated and indestructible and exempt from increase and alteration, since everything that comes to be comes into being from its contrary and in some substrate, and passes away likewise in a substrate by the action of the contrary into the contrary, as we explained in our opening discussions. Now the motions of contraries are contrary. If then this body can have no contrary, because there can be no contrary motion to the circular, nature seems justly to have exempted from contraries the body which was to be ungenerated and indestructible. For it is in contraries that generation and decay subsist. Again, that which is subject to increase increases upon contact with a kindred body, which is resolved into its matter. But there is nothing out of which this body can have been generated. And if it is exempt from increase and diminution, the same reasoning leads us to suppose that it is also unalterable. For alteration is movement in respect of quality; and qualitative states and dispositions, such as health and disease, do not come into being without changes of properties. But all natural bodies which change their properties we see to be subject without exception to increase and diminution. This is the case, for instance, with the bodies of animals and their parts and with vegetable bodies, and similarly also with those of the elements. And so, if the body which moves with a circular motion cannot admit of increase or diminution, it is reasonable to suppose that it is also unalterable.

The reasons why the primary body is eternal and not subject to increase or diminution, but unaging and unalterable and unmodified, will be clear from what has been said to any one who believes in our assumptions. Our theory seems to confirm experience and to be confirmed by it. For all men have some conception of the nature of the gods, and all who believe in the existence of gods at all, whether barbarian or Greek, agree in allotting the highest place to the deity, surely because they suppose that immortal is linked with immortal and regard any other supposition as inconceivable. If then there is, as there certainly is, anything divine, what we have just said about the

primary bodily substance was well said. The mere evidence of the senses is enough to convince us of this, at least with human certainty. For in the whole range of time past, so far as our inherited records reach, no change appears to have taken place either in the whole scheme of the outermost heaven or in any of its proper parts. The common name, too, which has been handed down from our distant ancestors even to our own day, seems to show that they conceived of it in the fashion which we have been expressing. The same ideas, one must believe, recur in men's minds not once or twice but again and again. And so, implying that the primary body is something else beyond earth, fire, air, and water, they gave the highest place a name of its own, aither, derived from the fact that it 'runs always' for an eternity of time. Anaxagoras, however, scandalously misuses this name, taking aither as equivalent to fire.

It is also clear from what has been said why the number of what we call simple bodies cannot be greater than it is. The motion of a simple body must itself be simple, and we assert that there are only these two simple motions, the circular and the straight, the latter being subdivided into motion away from and motion towards the centre.

4

That there is no other form of motion opposed as contrary to the circular may be proved in various ways. In the first place, there is an obvious tendency to oppose the straight line to the circular. For concave and convex are a not only regarded as opposed to one another, but they are also coupled together and treated as a unity in opposition to the straight. And so, if there is a contrary to circular motion, motion in a straight line must be recognized as having the best claim to that name. But the two forms of rectilinear motion are opposed to one another by reason of their places; for up and down is a difference and a contrary opposition in place. Secondly, it may be thought that the same reasoning which holds good of the rectilinear path applies also the circular, movement from A to B being opposed

as contrary to movement from B to A. But what is meant is still rectilinear motion. For that is limited to a single path, while the circular paths which pass through the same two points are infinite in number. Even if we are confined to the single semicircle and the opposition is between movement from C to D and from D to C along that semicircle, the case is no better. For the motion is the same as that along the diameter, since we invariably regard the distance between two points as the length of the straight line which joins them. It is no more satisfactory to construct a circle and treat motion 'along one semicircle as contrary to motion along the other. For example, taking a complete circle, motion from E to F on the semicircle G may be opposed to motion from F to E on the semicircle H. But even supposing these are contraries, it in no way follows that the reverse motions on the complete circumference contraries. Nor again can motion along the circle from A to B be regarded as the contrary of motion from A to C: for the motion goes from the same point towards the same point, and contrary motion was distinguished as motion from a contrary to its contrary. And even if the motion round a circle is the contrary of the reverse motion, one of the two would be ineffective: for both move to the same point, because that which moves in a circle, at whatever point it begins, must necessarily pass through all the contrary places alike. (By contrarieties of place I mean up and down, back and front, and right and left; and the contrary oppositions of movements are determined by those of places.) One of the motions, then, would be ineffective, for if the two motions were of equal strength, there would be no movement either way, and if one of the two were preponderant, the other would be inoperative. So that if both bodies were there, one of them, inasmuch as it would not be moving with its own movement, would be useless, in the sense in which a shoe is useless when it is not worn. But God and nature create nothing that has not its use.

5

This being clear, we must go on to consider the questions which remain. First, is there an infinite body, as the majority of the ancient philosophers thought, or is this an impossibility? The decision of this question, either way, is not unimportant, but rather all-important, to our search for the truth. It is this problem which has practically always been the source of the differences of those who have written about nature as a whole. So it has been and so it must be; since the least initial deviation from the truth is multiplied later a thousandfold. Admit, for instance, the existence of a minimum magnitude, and you will find that the minimum which you have introduced, small as it is, causes the greatest truths of mathematics to totter. The reason is that a principle is great rather in power than in extent; hence that which was small at the start turns out a giant at the end. Now the conception of the infinite possesses this power of principles, and indeed in the sphere of quantity possesses it in a higher degree than any other conception; so that it is in no way absurd or unreasonable that the assumption that an infinite body exists should be of peculiar moment to our inquiry. The infinite, then, we must now discuss, opening the whole matter from the beginning.

Every body is necessarily to be classed either as simple or as composite; the infinite body, therefore, will be either simple or composite.

But it is clear, further, that if the simple bodies are finite, the composite must also be finite, since that which is composed of bodies finite both in number and in magnitude is itself finite in respect of number and magnitude: its quantity is in fact the same as that of the bodies which compose it. What remains for us to consider, then, is whether any of the simple bodies can be infinite in magnitude, or whether this is impossible. Let us try the primary body first, and then go on to consider the others.

The body which moves in a circle must necessarily be finite in every respect, for the following reasons. (1) If the body so moving is infinite, the radii drawn from the centre will be infinite. But the space between infinite radii is infinite: and by the space between the radii I

mean the area outside which no magnitude which is in contact with the two lines can be conceived as falling. This, I say, will be infinite: first, because in the case of finite radii it is always finite; and secondly, because in it one can always go on to a width greater than any given width; thus the reasoning which forces us to believe in infinite number, because there is no maximum, applies also to the space between the radii. Now the infinite cannot be traversed, and if the body is infinite the interval between the radii is necessarily infinite: circular motion therefore is an impossibility. Yet our eyes tell us that the heavens revolve in a circle, and by argument also we have determined that there is something to which circular movement belongs.

(2) Again, if from a finite time a finite time be subtracted, what remains must be finite and have a beginning. And if the time of a journey has a beginning, there must be a beginning also of the movement, and consequently also of the distance traversed. This applies universally. Take a line, ACE, infinite in one direction, E, and another line, BB, infinite in both directions. Let ACE describe a circle, revolving upon C as centre. In its movement it will cut BB continuously for a certain time. This will be a finite time, since the total time is finite in which the heavens complete their circular orbit, and consequently the time subtracted from it, during which the one line in its motion cuts the other, is also finite. Therefore there will be a point at which ACE began for the first time to cut BB. This, however, is impossible. The infinite, then, cannot revolve in a circle; nor could the world, if it were infinite.

(3) That the infinite cannot move may also be shown as follows. Let A be a finite line moving past the finite line, B. Of necessity A will pass clear of B and B of A at the same moment; for each overlaps the other to precisely the same extent. Now if the two were both moving, and moving in contrary directions, they would pass clear of one another more rapidly; if one were still and the other moving past it, less rapidly; provided that the speed of the latter were the same in both cases. This, however, is clear: that it is impossible to traverse an infinite line in a finite time. Infinite time, then, would be required. (This we demonstrated above in the discussion of movement.) And it

makes no difference whether a finite is passing by an infinite or an infinite by a finite. For when A is passing B, then B overlaps A and it makes no difference whether B is moved or unmoved, except that, if both move, they pass clear of one another more quickly. It is, however, quite possible that a moving line should in certain cases pass one which is stationary quicker than it passes one moving in an opposite direction. One has only to imagine the movement to be slow where both move and much faster where one is stationary. To suppose one line stationary, then, makes no difficulty for our argument, since it is quite possible for A to pass B at a slower rate when both are moving than when only one is. If, therefore, the time which the finite moving line takes to pass the other is infinite, then necessarily the time occupied by the motion of the infinite past the finite is also infinite. For the infinite to move at all is thus absolutely impossible; since the very smallest movement conceivable must take an infinity of time. Moreover the heavens certainly revolve, and they complete their circular orbit in a finite time; so that they pass round the whole extent of any line within their orbit, such as the finite line AB. The revolving body, therefore, cannot be infinite.

(4) Again, as a line which has a limit cannot be infinite, or, if it is infinite, is so only in length, so a surface cannot be infinite in that respect in which it has a limit; or, indeed, if it is completely determinate, in any respect whatever. Whether it be a square or a circle or a sphere, it cannot be infinite, any more than a foot-rule can. There is then no such thing as an infinite sphere or square or circle, and where there is no circle there can be no circular movement, and similarly where there is no infinite at all there can be no infinite movement; and from this it follows that, an infinite circle being itself an impossibility, there can be no circular motion of an infinite body.

(5) Again, take a centre C, an infinite line, AB, another infinite line at right angles to it, E, and a moving radius, CD. CD will never cease contact with E, but the position will always be something like CE, CD cutting E at F. The infinite line, therefore, refuses to complete the circle.

(6) Again, if the heaven is infinite and moves in a circle, we shall have to admit that in a finite time it has traversed the infinite. For suppose the fixed heaven infinite, and that which moves within it equal to it. It results that when the infinite body has completed its revolution, it has traversed an infinite equal to itself in a finite time. But that we know to be impossible.

(7) It can also be shown, conversely, that if the time of revolution is finite, the area traversed must also be finite; but the area traversed was equal to itself; therefore, it is itself finite.

We have now shown that the body which moves in a circle is not endless or infinite, but has its limit.

6

Further, neither that which moves towards nor that which moves away from the centre can be infinite. For the upward and downward motions are contraries and are therefore motions towards contrary places. But if one of a pair of contraries is determinate, the other must be determinate also. Now the centre is determined; for, from whatever point the body which sinks to the bottom starts its downward motion, it cannot go farther than the centre. The centre, therefore, being determinate, the upper place must also be determinate. But if these two places are determined and finite, the corresponding bodies must also be finite. Further, if up and down are determinate, the intermediate place is also necessarily determinate. For, if it is indeterminate, the movement within it will be infinite; and that we have already shown to be an impossibility. The middle region then is determinate, and consequently any body which either is in it, or might be in it, is determinate. But the bodies which move up and down may be in it, since the one moves naturally away from the centre and the other towards it.

From this alone it is clear that an infinite body is an impossibility; but there is a further point. If there is no such thing as infinite weight, then it follows that none of these bodies can be infinite. For the supposed infinite body would have to be infinite in weight. (The same argument applies to lightness: for as the one supposition involves infinite weight, so the infinity of the body which rises to the surface involves infinite lightness.) This is proved as follows. Assume the weight to be finite, and take an infinite body, AB, of the weight C. Subtract from the infinite body a finite mass, BD, the weight of which shall be E. E then is less than C, since it is the weight of a lesser mass. Suppose then that the smaller goes into the greater a certain number of times, and take BF bearing the same proportion to BD which the greater weight bears to the smaller. For you may subtract as much as you please from an infinite. If now the masses are proportionate to the weights, and the lesser weight is that of the lesser mass, the greater must be that of the greater. The weights, therefore, of the finite and of the infinite body are equal. Again, if the weight of a greater body is greater than that of a less, the weight of GB will be greater than that of FB; and thus the weight of the finite body is greater than that of the infinite. And, further, the weight of unequal masses will be the same, since the infinite and the finite cannot be equal. It does not matter whether the weights are commensurable or not. If (a) they are incommensurable the same reasoning holds. For instance, suppose E multiplied by three is rather more than C: the weight of three masses of the full size of BD will be greater than C. We thus arrive at the same impossibility as before. Again (b) we may assume weights which are commensurate; for it makes no difference whether we begin with the weight or with the mass. For example, assume the weight E to be commensurate with C, and take from the infinite mass a part BD of weight E. Then let a mass BF be taken having the same proportion to BD which the two weights have to one another. (For the mass being infinite you may subtract from it as much as you please.) These assumed bodies will be commensurate in mass and in weight alike. Nor again does it make any difference to our demonstration whether the total mass has its weight equally or unequally distributed. For it must always be Possible to take from the

infinite mass a body of equal weight to BD by diminishing or increasing the size of the section to the necessary extent.

From what we have said, then, it is clear that the weight of the infinite body cannot be finite. It must then be infinite. We have therefore only to show this to be impossible in order to prove an infinite body impossible. But the impossibility of infinite weight can be shown in the following way. A given weight moves a given distance in a given time; a weight which is as great and more moves the same distance in a less time, the times being in inverse proportion to the weights. For instance, if one weight is twice another, it will take half as long over a given movement. Further, a finite weight traverses any finite distance in a finite time. It necessarily follows from this that infinite weight, if there is such a thing, being, on the one hand, as great and more than as great as the finite, will move accordingly, but being, on the other hand, compelled to move in a time inversely proportionate to its greatness, cannot move at all. The time should be less in proportion as the weight is greater. But there is no proportion between the infinite and the finite: proportion can only hold between a less and a greater finite time. And though you may say that the time of the movement can be continually diminished, yet there is no minimum. Nor, if there were, would it help us. For some finite body could have been found greater than the given finite in the same proportion which is supposed to hold between the infinite and the given finite; so that an infinite and a finite weight must have traversed an equal distance in equal time. But that is impossible. Again, whatever the time, so long as it is finite, in which the infinite performs the motion, a finite weight must necessarily move a certain finite distance in that same time. Infinite weight is therefore impossible, and the same reasoning applies also to infinite lightness. Bodies then of infinite weight and of infinite lightness are equally impossible.

That there is no infinite body may be shown, as we have shown it, by a detailed consideration of the various cases. But it may also be shown universally, not only by such reasoning as we advanced in our discussion of principles (though in that passage we have already determined universally the sense in which the existence of an

infinite is to be asserted or denied), but also suitably to our present purpose in the following way. That will lead us to a further question. Even if the total mass is not infinite, it may yet be great enough to admit a plurality of universes. The question might possibly be raised whether there is any obstacle to our believing that there are other universes composed on the pattern of our own, more than one, though stopping short of infinity. First, however, let us treat of the infinite universally.

7

Every body must necessarily be either finite or infinite, and if infinite, either of similar or of dissimilar parts. If its parts are dissimilar, they must represent either a finite or an infinite number of kinds. That the kinds cannot be infinite is evident, if our original presuppositions remain unchallenged. For the primary movements being finite in number, the kinds of simple body are necessarily also finite, since the movement of a simple body is simple, and the simple movements are finite, and every natural body must always have its proper motion. Now if the infinite body is to be composed of a finite number of kinds, then each of its parts must necessarily be infinite in quantity, that is to say, the water, fire, &c., which compose it. But this is impossible, because, as we have already shown, infinite weight and lightness do not exist. Moreover it would be necessary also that their places should be infinite in extent, so that the movements too of all these bodies would be infinite. But this is not possible, if we are to hold to the truth of our original presuppositions and to the view that neither that which moves downward, nor, by the same reasoning, that which moves upward, can prolong its movement to infinity. For it is true in regard to quality, quantity, and place alike that any process of change is impossible which can have no end. I mean that if it is impossible for a thing to have come to be white, or a cubit long, or in Egypt, it is also impossible for it to be in process of coming to be any of these. It is thus impossible for a thing to be moving to a place at which in its motion it can never by any possibility arrive. Again,

suppose the body to exist in dispersion, it may be maintained none the less that the total of all these scattered particles, say, of fire, is infinite. But body we saw to be that which has extension every way. How can there be several dissimilar elements, each infinite? Each would have to be infinitely extended every way.

It is no more conceivable, again, that the infinite should exist as a whole of similar parts. For, in the first place, there is no other (straight) movement beyond those mentioned: we must therefore give it one of them. And if so, we shall have to admit either infinite weight or infinite lightness. Nor, secondly, could the body whose movement is circular be infinite, since it is impossible for the infinite to move in a circle. This, indeed, would be as good as saying that the heavens are infinite, which we have shown to be impossible.

Moreover, in general, it is impossible that the infinite should move at all. If it did, it would move either naturally or by constraint: and if by constraint, it possesses also a natural motion, that is to say, there is another place, infinite like itself, to which it will move. But that is impossible.

That in general it is impossible for the infinite to be acted upon by the finite or to act upon it may be shown as follows.

(1. The infinite cannot be acted upon by the finite.) Let A be an infinite, B a finite, C the time of a given movement produced by one in the other. Suppose, then, that A was heated, or impelled, or modified in any way, or caused to undergo any sort of movement whatever, by in the time C. Let D be less than B; and, assuming that a lesser agent moves a lesser patient in an equal time, call the quantity thus modified by D, E. Then, as D is to B, so is E to some finite quantum. We assume that the alteration of equal by equal takes equal time, and the alteration of less by less or of greater by greater takes the same time, if the quantity of the patient is such as to keep the proportion which obtains between the agents, greater and less. If so, no movement can be caused in the infinite by any finite agent in any time whatever. For a less agent will produce that movement in a less patient in an equal time, and the proportionate equivalent of

that patient will be a finite quantity, since no proportion holds between finite and infinite.

(2. The infinite cannot act upon the finite.) Nor, again, can the infinite produce a movement in the finite in any time whatever. Let A be an infinite, B a finite, C the time of action. In the time C, D will produce that motion in a patient less than B, say F. Then take E, bearing the same proportion to D as the whole BF bears to F. E will produce the motion in BF in the time C. Thus the finite and infinite effect the same alteration in equal times. But this is impossible; for the assumption is that the greater effects it in a shorter time. It will be the same with any time that can be taken, so that there will no time in which the infinite can effect this movement. And, as to infinite time, in that nothing can move another or be moved by it. For such time has no limit, while the action and reaction have.

(3. There is no interaction between infinites.) Nor can infinite be acted upon in any way by infinite. Let A and B be infinites, CD being the time of the action A of upon B. Now the whole B was modified in a certain time, and the part of this infinite, E, cannot be so modified in the same time, since we assume that a less quantity makes the movement in a less time. Let E then, when acted upon by A, complete the movement in the time D. Then, as D is to CD, so is E to some finite part of B. This part will necessarily be moved by A in the time CD. For we suppose that the same agent produces a given effect on a greater and a smaller mass in longer and shorter times, the times and masses varying proportionately. There is thus no finite time in which infinites can move one another. Is their time then infinite? No, for infinite time has no end, but the movement communicated has.

If therefore every perceptible body possesses the power of acting or of being acted upon, or both of these, it is impossible that an infinite body should be perceptible. All bodies, however, that occupy place are perceptible. There is therefore no infinite body beyond the heaven. Nor again is there anything of limited extent beyond it. And so beyond the heaven there is no body at all. For if you suppose it an object of intelligence, it will be in a place – since place is what

‘within’ and ‘beyond’ denote – and therefore an object of perception. But nothing that is not in a place is perceptible.

The question may also be examined in the light of more general considerations as follows. The infinite, considered as a whole of similar parts, cannot, on the one hand, move in a circle. For there is no centre of the infinite, and that which moves in a circle moves about the centre. Nor again can the infinite move in a straight line. For there would have to be another place infinite like itself to be the goal of its natural movement and another, equally great, for the goal of its unnatural movement. Moreover, whether its rectilinear movement is natural or constrained, in either case the force which causes its motion will have to be infinite. For infinite force is force of an infinite body, and of an infinite body the force is infinite. So the motive body also will be infinite. (The proof of this is given in our discussion of movement, where it is shown that no finite thing possesses infinite power, and no infinite thing finite power.) If then that which moves naturally can also move unnaturally, there will be two infinites, one which causes, and another which exhibits the latter motion. Again, what is it that moves the infinite? If it moves itself, it must be animate. But how can it possibly be conceived as an infinite animal? And if there is something else that moves it, there will be two infinites, that which moves and that which is moved, differing in their form and power.

If the whole is not continuous, but exists, as Democritus and Leucippus think, in the form of parts separated by void, there must necessarily be one movement of all the multitude. They are distinguished, we are told, from one another by their figures; but their nature is one, like many pieces of gold separated from one another. But each piece must, as we assert, have the same motion. For a single clod moves to the same place as the whole mass of earth, and a spark to the same place as the whole mass of fire. So that if it be weight that all possess, no body is, strictly speaking, light: and if lightness be universal, none is heavy. Moreover, whatever possesses weight or lightness will have its place either at one of the extremes or in the middle region. But this is impossible while the world is conceived as infinite. And, generally, that which has no centre or

extreme limit, no up or down, gives the bodies no place for their motion; and without that movement is impossible. A thing must move either naturally or unnaturally, and the two movements are determined by the proper and alien places. Again, a place in which a thing rests or to which it moves unnaturally, must be the natural place for some other body, as experience shows. Necessarily, therefore, not everything possesses weight or lightness, but some things do and some do not. From these arguments then it is clear that the body of the universe is not infinite.

8

We must now proceed to explain why there cannot be more than one heaven – the further question mentioned above. For it may be thought that we have not proved universal of bodies that none whatever can exist outside our universe, and that our argument applied only to those of indeterminate extent.

Now all things rest and move naturally and by constraint. A thing moves naturally to a place in which it rests without constraint, and rests naturally in a place to which it moves without constraint. On the other hand, a thing moves by constraint to a place in which it rests by constraint, and rests by constraint in a place to which it moves by constraint. Further, if a given movement is due to constraint, its contrary is natural. If, then, it is by constraint that earth moves from a certain place to the centre here, its movement from here to there will be natural, and if earth from there rests here without constraint, its movement hither will be natural. And the natural movement in each case is one. Further, these worlds, being similar in nature to ours, must all be composed of the same bodies as it. Moreover each of the bodies, fire, I mean, and earth and their intermediates, must have the same power as in our world. For if these names are used equivocally, if the identity of name does not rest upon an identity of form in these elements and ours, then the whole to which they belong can only be called a world by

equivocation. Clearly, then, one of the bodies will move naturally away from the centre and another towards the centre, since fire must be identical with fire, earth with earth, and so on, as the fragments of each are identical in this world. That this must be the case is evident from the principles laid down in our discussion of the movements, for these are limited in number, and the distinction of the elements depends upon the distinction of the movements. Therefore, since the movements are the same, the elements must also be the same everywhere. The particles of earth, then, in another world move naturally also to our centre and its fire to our circumference. This, however, is impossible, since, if it were true, earth must, in its own world, move upwards, and fire to the centre; in the same way the earth of our world must move naturally away from the centre when it moves towards the centre of another universe. This follows from the supposed juxtaposition of the worlds. For either we must refuse to admit the identical nature of the simple bodies in the various universes, or, admitting this, we must make the centre and the extremity one as suggested. This being so, it follows that there cannot be more worlds than one.

To postulate a difference of nature in the simple bodies according as they are more or less distant from their proper places is unreasonable. For what difference can it make whether we say that a thing is this distance away or that? One would have to suppose a difference proportionate to the distance and increasing with it, but the form is in fact the same. Moreover, the bodies must have some movement, since the fact that they move is quite evident. Are we to say then that all their movements, even those which are mutually contrary, are due to constraint? No, for a body which has no natural movement at all cannot be moved by constraint. If then the bodies have a natural movement, the movement of the particular instances of each form must necessarily have for goal a place numerically one, i.e. a particular centre or a particular extremity. If it be suggested that the goal in each case is one in form but numerically more than one, on the analogy of particulars which are many though each undifferentiated in form, we reply that the variety of goal cannot be limited to this portion or that but must extend to all alike. For all are equally undifferentiated in form, but any one is different numerically

from any other. What I mean is this: if the portions in this world behave similarly both to one another and to those in another world, then the portion which is taken hence will not behave differently either from the portions in another world or from those in the same world, but similarly to them, since in form no portion differs from another. The result is that we must either abandon our present assumption or assert that the centre and the extremity are each numerically one. But this being so, the heaven, by the same evidence and the same necessary inferences, must be one only and no more.

A consideration of the other kinds of movement also makes it plain that there is some point to which earth and fire move naturally. For in general that which is moved changes from something into something, the starting-point and the goal being different in form, and always it is a finite change. For instance, to recover health is to change from disease to health, to increase is to change from smallness to greatness. Locomotion must be similar: for it also has its goal and starting-point – and therefore the starting-point and the goal of the natural movement must differ in form – just as the movement of coming to health does not take any direction which chance or the wishes of the mover may select. Thus, too, fire and earth move not to infinity but to opposite points; and since the opposition in place is between above and below, these will be the limits of their movement. (Even in circular movement there is a sort of opposition between the ends of the diameter, though the movement as a whole has no contrary: so that here too the movement has in a sense an opposed and finite goal.) There must therefore be some end to locomotion: it cannot continue to infinity.

This conclusion that local movement is not continued to infinity is corroborated by the fact that earth moves more quickly the nearer it is to the centre, and fire the nearer it is to the upper place. But if movement were infinite speed would be infinite also; and if speed then weight and lightness. For as superior speed in downward movement implies superior weight, so infinite increase of weight necessitates infinite increase of speed.

Further, it is not the action of another body that makes one of these bodies move up and the other down; nor is it constraint, like the ‘extrusion’ of some writers. For in that case the larger the mass of fire or earth the slower would be the upward or downward movement; but the fact is the reverse: the greater the mass of fire or earth the quicker always is its movement towards its own place. Again, the speed of the movement would not increase towards the end if it were due to constraint or extrusion; for a constrained movement always diminishes in speed as the source of constraint becomes more distant, and a body moves without constraint to the place whence it was moved by constraint.

A consideration of these points, then, gives adequate assurance of the truth of our contentions. The same could also be shown with the aid of the discussions which fall under First Philosophy, as well as from the nature of the circular movement, which must be eternal both here and in the other worlds. It is plain, too, from the following considerations that the universe must be one.

The bodily elements are three, and therefore the places of the elements will be three also; the place, first, of the body which sinks to the bottom, namely the region about the centre; the place, secondly, of the revolving body, namely the outermost place, and thirdly, the intermediate place, belonging to the intermediate body. Here in this third place will be the body which rises to the surface; since, if not here, it will be elsewhere, and it cannot be elsewhere: for we have two bodies, one weightless, one endowed with weight, and below is place of the body endowed with weight, since the region about the centre has been given to the heavy body. And its position cannot be unnatural to it, for it would have to be natural to something else, and there is nothing else. It must then occupy the intermediate place. What distinctions there are within the intermediate itself we will explain later on.

We have now said enough to make plain the character and number of the bodily elements, the place of each, and further, in general, how many in number the various places are.

9

We must show not only that the heaven is one, but also that more than one heaven is and, further, that, as exempt from decay and generation, the heaven is eternal. We may begin by raising a difficulty. From one point of view it might seem impossible that the heaven should be one and unique, since in all formations and products whether of nature or of art we can distinguish the shape in itself and the shape in combination with matter. For instance the form of the sphere is one thing and the gold or bronze sphere another; the shape of the circle again is one thing, the bronze or wooden circle another. For when we state the essential nature of the sphere or circle we do not include in the formula gold or bronze, because they do not belong to the essence, but if we are speaking of the copper or gold sphere we do include them. We still make the distinction even if we cannot conceive or apprehend any other example beside the particular thing. This may, of course, sometimes be the case: it might be, for instance, that only one circle could be found; yet none the less the difference will remain between the being of circle and of this particular circle, the one being form, the other form in matter, i.e. a particular thing. Now since the universe is perceptible it must be regarded as a particular; for everything that is perceptible subsists, as we know, in matter. But if it is a particular, there will be a distinction between the being of 'this universe' and of 'universe' unqualified. There is a difference, then, between 'this universe' and simple 'universe'; the second is form and shape, the first form in combination with matter; and any shape or form has, or may have, more than one particular instance.

On the supposition of Forms such as some assert, this must be the case, and equally on the view that no such entity has a separate existence. For in every case in which the essence is in matter it is a fact of observation that the particulars of like form are several or infinite in number. Hence there either are, or may be, more heavens than one. On these grounds, then, it might be inferred either that there are or that there might be several heavens. We must, however,

return and ask how much of this argument is correct and how much not.

Now it is quite right to say that the formula of the shape apart from the matter must be different from that of the shape in the matter, and we may allow this to be true. We are not, however, therefore compelled to assert a plurality of worlds. Such a plurality is in fact impossible if this world contains the entirety of matter, as in fact it does. But perhaps our contention can be made clearer in this way. Suppose 'aquilinity' to be curvature in the nose or flesh, and flesh to be the matter of aquilinity. Suppose further, that all flesh came together into a single whole of flesh endowed with this aquiline quality. Then neither would there be, nor could there arise, any other thing that was aquiline. Similarly, suppose flesh and bones to be the matter of man, and suppose a man to be created of all flesh and all bones in indissoluble union. The possibility of another man would be removed. Whatever case you took it would be the same. The general rule is this: a thing whose essence resides in a substratum of matter can never come into being in the absence of all matter. Now the universe is certainly a particular and a material thing: if however, it is composed not of a part but of the whole of matter, then though the being of 'universe' and of 'this universe' are still distinct, yet there is no other universe, and no possibility of others being made, because all the matter is already included in this. It remains, then, only to prove that it is composed of all natural perceptible body.

First, however, we must explain what we mean by 'heaven' and in how many senses we use the word, in order to make clearer the object of our inquiry. (a) In one sense, then, we call 'heaven' the substance of the extreme circumference of the whole, or that natural body whose place is at the extreme circumference. We recognize habitually a special right to the name 'heaven' in the extremity or upper region, which we take to be the seat of all that is divine. (b) In another sense, we use this name for the body continuous with the extreme circumference which contains the moon, the sun, and some of the stars; these we say are 'in the heaven'. (c) In yet another sense we give the name to all body included within extreme circumference,

since we habitually call the whole or totality 'the heaven'. The word, then, is used in three senses.

Now the whole included within the extreme circumference must be composed of all physical and sensible body, because there neither is, nor can come into being, any body outside the heaven. For if there is a natural body outside the extreme circumference it must be either a simple or a composite body, and its position must be either natural or unnatural. But it cannot be any of the simple bodies. For, first, it has been shown that that which moves in a circle cannot change its place. And, secondly, it cannot be that which moves from the centre or that which lies lowest. Naturally they could not be there, since their proper places are elsewhere; and if these are there unnaturally, the exterior place will be natural to some other body, since a place which is unnatural to one body must be natural to another: but we saw that there is no other body besides these. Then it is not possible that any simple body should be outside the heaven. But, if no simple body, neither can any mixed body be there: for the presence of the simple body is involved in the presence of the mixture. Further neither can any body come into that place: for it will do so either naturally or unnaturally, and will be either simple or composite; so that the same argument will apply, since it makes no difference whether the question is 'does A exist?' or 'could A come to exist?' From our arguments then it is evident not only that there is not, but also that there could never come to be, any bodily mass whatever outside the circumference. The world as a whole, therefore, includes all its appropriate matter, which is, as we saw, natural perceptible body. So that neither are there now, nor have there ever been, nor can there ever be formed more heavens than one, but this heaven of ours is one and unique and complete.

It is therefore evident that there is also no place or void or time outside the heaven. For in every place body can be present; and void is said to be that in which the presence of body, though not actual, is possible; and time is the number of movement. But in the absence of natural body there is no movement, and outside the heaven, as we have shown, body neither exists nor can come to exist. It is clear then that there is neither place, nor void, nor time, outside the heaven.

Hence whatever is there, is of such a nature as not to occupy any place, nor does time age it; nor is there any change in any of the things which lie beyond the outermost motion; they continue through their entire duration unalterable and unmodified, living the best and most selfsufficient of lives. As a matter of fact, this word ‘duration’ possessed a divine significance for the ancients, for the fulfilment which includes the period of life of any creature, outside of which no natural development can fall, has been called its duration. On the same principle the fulfilment of the whole heaven, the fulfilment which includes all time and infinity, is ‘duration’ – a name based upon the fact that it is always – duration immortal and divine. From it derive the being and life which other things, some more or less articulately but others feebly, enjoy. So, too, in its discussions concerning the divine, popular philosophy often propounds the view that whatever is divine, whatever is primary and supreme, is necessarily unchangeable. This fact confirms what we have said. For there is nothing else stronger than it to move it – since that would mean more divine – and it has no defect and lacks none of its proper excellences. Its unceasing movement, then, is also reasonable, since everything ceases to move when it comes to its proper place, but the body whose path is the circle has one and the same place for starting-point and goal.

10

Having established these distinctions, we may now proceed to the question whether the heaven is ungenerated or generated, indestructible or destructible. Let us start with a review of the theories of other thinkers; for the proofs of a theory are difficulties for the contrary theory. Besides, those who have first heard the pleas of our adversaries will be more likely to credit the assertions which we are going to make. We shall be less open to the charge of procuring judgement by default. To give a satisfactory decision as to the truth it is necessary to be rather an arbitrator than a party to the dispute.

That the world was generated all are agreed, but, generation over, some say that it is eternal, others say that it is destructible like any other natural formation. Others again, with Empedliocles of Acragas and Heraclitus of Ephesus, believe that there is alternation in the destructive process, which takes now this direction, now that, and continues without end.

Now to assert that it was generated and yet is eternal is to assert the impossible; for we cannot reasonably attribute to anything any characteristics but those which observation detects in many or all instances. But in this case the facts point the other way: generated things are seen always to be destroyed. Further, a thing whose present state had no beginning and which could not have been other than it was at any previous moment throughout its entire duration, cannot possibly be changed. For there will have to be some cause of change, and if this had been present earlier it would have made possible another condition of that to which any other condition was impossible. Suppose that the world was formed out of elements which were formerly otherwise conditioned than as they are now. Then (1) if their condition was always so and could not have been otherwise, the world could never have come into being. And (2) if the world did come into being, then, clearly, their condition must have been capable of change and not eternal: after combination therefore they will be dispersed, just as in the past after dispersion they came into combination, and this process either has been, or could have been, indefinitely repeated. But if this is so, the world cannot be indestructible, and it does not matter whether the change of condition has actually occurred or remains a possibility.

Some of those who hold that the world, though indestructible, was yet generated, try to support their case by a parallel which is illusory. They say that in their statements about its generation they are doing what geometricians do when they construct their figures, not implying that the universe really had a beginning, but for didactic reasons facilitating understanding by exhibiting the object, like the figure, as in course of formation. The two cases, as we said, are not parallel; for, in the construction of the figure, when the various steps are completed the required figure forthwith results; but in these

other demonstrations what results is not that which was required. Indeed it cannot be so; for antecedent and consequent, as assumed, are in contradiction. The ordered, it is said, arose out of the unordered; and the same thing cannot be at the same time both ordered and unordered; there must be a process and a lapse of time separating the two states. In the figure, on the other hand, there is no temporal separation. It is clear then that the universe cannot be at once eternal and generated.

To say that the universe alternately combines and dissolves is no more paradoxical than to make it eternal but varying in shape. It is as if one were to think that there was now destruction and now existence when from a child a man is generated, and from a man a child. For it is clear that when the elements come together the result is not a chance system and combination, but the very same as before – especially on the view of those who hold this theory, since they say that the contrary is the cause of each state. So that if the totality of body, which is a continuum, is now in this order or disposition and now in that, and if the combination of the whole is a world or heaven, then it will not be the world that comes into being and is destroyed, but only its dispositions.

If the world is believed to be one, it is impossible to suppose that it should be, as a whole, first generated and then destroyed, never to reappear; since before it came into being there was always present the combination prior to it, and that, we hold, could never change if it was never generated. If, on the other hand, the worlds are infinite in number the view is more plausible. But whether this is, or is not, impossible will be clear from what follows. For there are some who think it possible both for the ungenerated to be destroyed and for the generated to persist undestroyed. (This is held in the Timaeus, where Plato says that the heaven, though it was generated, will none the less exist to eternity.) So far as the heaven is concerned we have answered this view with arguments appropriate to the nature of the heaven: on the general question we shall attain clearness when we examine the matter universally.

11

We must first distinguish the senses in which we use the words ‘ungenerated’ and ‘generated’, ‘destructible’ and ‘indestructible’. These have many meanings, and though it may make no difference to the argument, yet some confusion of mind must result from treating as uniform in its use a word which has several distinct applications. The character which is the ground of the predication will always remain obscure.

The word ‘ungenerated’ then is used (a) in one sense whenever something now is which formerly was not, no process of becoming or change being involved. Such is the case, according to some, with contact and motion, since there is no process of coming to be in contact or in motion. (b) It is used in another sense, when something which is capable of coming to be, with or without process, does not exist; such a thing is ungenerated in the sense that its generation is not a fact but a possibility. (c) It is also applied where there is general impossibility of any generation such that the thing now is which then was not. And ‘impossibility’ has two uses: first, where it is untrue to say that the thing can ever come into being, and secondly, where it cannot do so easily, quickly, or well. In the same way the word ‘generated’ is used, (a) first, where what formerly was not afterwards is, whether a process of becoming was or was not involved, so long as that which then was not, now is; (b) secondly, of anything capable of existing, ‘capable’ being defined with reference either to truth or to facility; (c) thirdly, of anything to which the passage from not being to being belongs, whether already actual, if its existence is due to a past process of becoming, or not yet actual but only possible. The uses of the words ‘destructible’ and ‘indestructible’ are similar. ‘Destructible’ is applied (a) to that which formerly was and afterwards either is not or might not be, whether a period of being destroyed and changed intervenes or not; and (b) sometimes we apply the word to that which a process of destruction may cause not to be; and also (c) in a third sense, to that which is easily destructible, to the ‘easily destroyed’, so to speak. Of the

indestructible the same account holds good. It is either (a) that which now is and now is not, without any process of destruction, like contact, which without being destroyed afterwards is not, though formerly it was; or (b) that which is but might not be, or which will at some time not be, though it now is. For you exist now and so does the contact; yet both are destructible, because a time will come when it will not be true of you that you exist, nor of these things that they are in contact. Thirdly (c) in its most proper use, it is that which is, but is incapable of any destruction such that the thing which now is later ceases to be or might cease to be; or again, that which has not yet been destroyed, but in the future may cease to be. For indestructible is also used of that which is destroyed with difficulty.

This being so, we must ask what we mean by 'possible' and 'impossible'. For in its most proper use the predicate 'indestructible' is given because it is impossible that the thing should be destroyed, i.e. exist at one time and not at another. And 'ungenerated' also involves impossibility when used for that which cannot be generated, in such fashion that, while formerly it was not, later it is. An instance is a commensurable diagonal. Now when we speak of a power to move or to lift weights, we refer always to the maximum. We speak, for instance, of a power to lift a hundred talents or walk a hundred stades – though a power to effect the maximum is also a power to effect any part of the maximum – since we feel obliged in defining the power to give the limit or maximum. A thing, then, which is within it. If, for example, a man can lift a hundred talents, he can also lift two, and if he can walk a hundred stades, he can also walk two. But the power is of the maximum, and a thing said, with reference to its maximum, to be incapable of so much is also incapable of any greater amount. It is, for instance, clear that a person who cannot walk a thousand stades will also be unable to walk a thousand and one. This point need not trouble us, for we may take it as settled that what is, in the strict sense, possible is determined by a limiting maximum. Now perhaps the objection might be raised that there is no necessity in this, since he who sees a stade need not see the smaller measures contained in it, while, on the contrary, he who can see a dot or hear a small sound will perceive what is greater. This, however, does not touch our argument. The maximum may be

determined either in the power or in its object. The application of this is plain. Superior sight is sight of the smaller body, but superior speed is that of the greater body.

12

Having established these distinctions we car now proceed to the sequel. If there are thing! capable both of being and of not being, there must be some definite maximum time of their being and not being; a time, I mean, during which continued existence is possible to them and a time during which continued nonexistence is possible. And this is true in every category, whether the thing is, for example, 'man', or 'white', or 'three cubits long', or whatever it may be. For if the time is not definite in quantity, but longer than any that can be suggested and shorter than none, then it will be possible for one and the same thing to exist for infinite time and not to exist for another infinity. This, however, is impossible.

Let us take our start from this point. The impossible and the false have not the same significance. One use of 'impossible' and 'possible', and 'false' and 'true', is hypothetical. It is impossible, for instance, on a certain hypothesis that the triangle should have its angles equal to two right angles, and on another the diagonal is commensurable. But there are also things possible and impossible, false and true, absolutely. Now it is one thing to be absolutely false, and another thing to be absolutely impossible. To say that you are standing when you are not standing is to assert a falsehood, but not an impossibility. Similarly to say that a man who is playing the harp, but not singing, is singing, is to say what is false but not impossible. To say, however, that you are at once standing and sitting, or that the diagonal is commensurable, is to say what is not only false but also impossible. Thus it is not the same thing to make a false and to make an impossible hypothesis, and from the impossible hypothesis impossible results follow. A man has, it is true, the capacity at once of sitting and of standing, because when he possesses the one he also

possesses the other; but it does not follow that he can at once sit and stand, only that at another time he can do the other also. But if a thing has for infinite time more than one capacity, another time is impossible and the times must coincide. Thus if a thing which exists for infinite time is destructible, it will have the capacity of not being. Now if it exists for infinite time let this capacity be actualized; and it will be in actuality at once existent and non-existent. Thus a false conclusion would follow because a false assumption was made, but if what was assumed had not been impossible its consequence would not have been impossible.

Anything then which always exists is absolutely imperishable. It is also ungenerated, since if it was generated it will have the power for some time of not being. For as that which formerly was, but now is not, or is capable at some future time of not being, is destructible, so that which is capable of formerly not having been is generated. But in the case of that which always is, there is no time for such a capacity of not being, whether the supposed time is finite or infinite; for its capacity of being must include the finite time since it covers infinite time.

It is therefore impossible that one and the same thing should be capable of always existing and of always not-existing. And 'not always existing', the contradictory, is also excluded. Thus it is impossible for a thing always to exist and yet to be destructible. Nor, similarly, can it be generated. For of two attributes if B cannot be present without A, the impossibility A of proves the impossibility of B. What always is, then, since it is incapable of ever not being, cannot possibly be generated. But since the contradictory of 'that which is always capable of being' 'that which is not always capable of being'; while 'that which is always capable of not being' is the contrary, whose contradictory in turn is 'that which is not always capable of not being', it is necessary that the contradictories of both terms should be predicable of one and the same thing, and thus that, intermediate between what always is and what always is not, there should be that to which being and not-being are both possible; for the contradictory of each will at times be true of it unless it always exists. Hence that which not always is not will sometimes be and

sometimes not be; and it is clear that this is true also of that which cannot always be but sometimes is and therefore sometimes is not. One thing, then, will have the power of being, and will thus be intermediate between the other two.

Expresed universally our argument is as follows. Let there be two attributes, A and B, not capable of being present in any one thing together, while either A or C and either B or D are capable of being present in everything. Then C and D must be predicated of everything of which neither A nor B is predicated. Let E lie between A and B; for that which is neither of two contraries is a mean between them. In E both C and D must be present, for either A or C is present everywhere and therefore in E. Since then A is impossible, C must be present, and the same argument holds of D.

Neither that which always is, therefore, nor that which always is not is either generated or destructible. And clearly whatever is generated or destructible is not eternal. If it were, it would be at once capable of always being and capable of not always being, but it has already been shown that this is impossible. Surely then whatever is ungenerated and in being must be eternal, and whatever is indestructible and in being must equally be so. (I use the words 'ungenerated' and 'indestructible' in their proper sense, 'ungenerated' for that which now is and could not at any previous time have been truly said not to be; 'indestructible' for that which now is and cannot at any future time be truly said not to be.) If, again, the two terms are coincident, if the ungenerated is indestructible, and the indestructible ungenearted, then each of them is coincident with 'eternal'; anything ungenerated is eternal and anything indestructible is eternal. This is clear too from the definition of the terms, Whatever is destructible must be generated; for it is either ungenerated, or generated, but, if ungenerated, it is by hypothesis indestructible. Whatever, further, is generated must be destructible. For it is either destructible or indestructible, but, if indestructible, it is by hypothesis ungenerated.

If, however, 'indestructible' and 'ungenerated' are not coincident, there is no necessity that either the ungenerated or the indestructible should be eternal. But they must be coincident, for the

following reasons. The terms 'generated' and 'destructible' are coincident; this is obvious from our former remarks, since between what always is and what always is not there is an intermediate which is neither, and that intermediate is the generated and destructible. For whatever is either of these is capable both of being and of not being for a definite time: in either case, I mean, there is a certain period of time during which the thing is and another during which it is not. Anything therefore which is generated or destructible must be intermediate. Now let A be that which always is and B that which always is not, C the generated, and D the destructible. Then C must be intermediate between A and B. For in their case there is no time in the direction of either limit, in which either A is not or B is. But for the generated there must be such a time either actually or potentially, though not for A and B in either way. C then will be, and also not be, for a limited length of time, and this is true also of D, the destructible. Therefore each is both generated and destructible. Therefore 'generated' and 'destructible' are coincident. Now let E stand for the ungenerated, F for the generated, G for the indestructible, and H for the destructible. As for F and H, it has been shown that they are coincident. But when terms stand to one another as these do, F and H coincident, E and F never predicated of the same thing but one or other of everything, and G and H likewise, then E and G must needs be coincident. For suppose that E is not coincident with G, then F will be, since either E or F is predictable of everything. But of that of which F is predicated H will be predicable also. H will then be coincident with G, but this we saw to be impossible. And the same argument shows that G is coincident with E.

Now the relation of the ungenerated (E) to the generated (F) is the same as that of the indestructible (G) to the destructible (H). To say then that there is no reason why anything should not be generated and yet indestructible or ungenerated and yet destroyed, to imagine that in the one case generation and in the other case destruction occurs once for all, is to destroy part of the data. For (1) everything is capable of acting or being acted upon, of being or not being, either for an infinite, or for a definitely limited space of time; and the infinite time is only a possible alternative because it is after a fashion defined, as a length of time which cannot be exceeded. But infinity in

one direction is neither infinite or finite. (2) Further, why, after always existing, was the thing destroyed, why, after an infinity of not being, was it generated, at one moment rather than another? If every moment is alike and the moments are infinite in number, it is clear that a generated or destructible thing existed for an infinite time. It has therefore for an infinite time the capacity of not being (since the capacity of being and the capacity of not being will be present together), if destructible, in the time before destruction, if generated, in the time after generation. If then we assume the two capacities to be actualized, opposites will be present together. (3) Further, this second capacity will be present like the first at every moment, so that the thing will have for an infinite time the capacity both of being and of not being; but this has been shown to be impossible. (4) Again, if the capacity is present prior to the activity, it will be present for all time, even while the thing was as yet ungenerated and non-existent, throughout the infinite time in which it was capable of being generated. At that time, then, when it was not, at that same time it had the capacity of being, both of being then and of being thereafter, and therefore for an infinity of time.

It is clear also on other grounds that it is impossible that the destructible should not at some time be destroyed. For otherwise it will always be at once destructible and in actuality indestructible, so that it will be at the same time capable of always existing and of not always existing. Thus the destructible is at some time actually destroyed. The generable, similarly, has been generated, for it is capable of having been generated and thus also of not always existing.

We may also see in the following way how impossible it is either for a thing which is generated to be thenceforward indestructible, or for a thing which is ungenerated and has always hitherto existed to be destroyed. Nothing that is by chance can be indestructible or ungenerated, since the products of chance and fortune are opposed to what is, or comes to be, always or usually, while anything which exists for a time infinite either absolutely or in one direction, is in existence either always or usually. That which is by chance, then, is by nature such as to exist at one time and not at another. But in

things of that character the contradictory states proceed from one and the same capacity, the matter of the thing being the cause equally of its existence and of its non-existence. Hence contradictories would be present together in actuality.

Further, it cannot truly be said of a thing now that it exists last year, nor could it be said last year that it exists now. It is therefore impossible for what once did not exist later to be eternal. For in its later state it will possess the capacity of not existing, only not of not existing at a time when it exists – since then it exists in actuality – but of not existing last year or in the past. Now suppose it to be in actuality what it is capable of being. It will then be true to say now that it does not exist last year. But this is impossible. No capacity relates to being in the past, but always to being in the present or future. It is the same with the notion of an eternity of existence followed later by non-existence. In the later state the capacity will be present for that which is not there in actuality. Actualize, then, the capacity. It will be true to say now that this exists last year or in the past generally.

Considerations also not general like these but proper to the subject show it to be impossible that what was formerly eternal should later be destroyed or that what formerly was not should later be eternal. Whatever is destructible or generated is always alterable. Now alteration is due to contraries, and the things which compose the natural body are the very same that destroy it.

Book II

1

That the heaven as a whole neither came into being nor admits of destruction, as some assert, but is one and eternal, with no end or beginning of its total duration, containing and embracing in itself the infinity of time, we may convince ourselves not only by the arguments already set forth but also by a consideration of the views of those who differ from us in providing for its generation. If our view is a possible one, and the manner of generation which they assert is impossible, this fact will have great weight in convincing us of the immortality and eternity of the world. Hence it is well to persuade oneself of the truth of the ancient and truly traditional theories, that there is some immortal and divine thing which possesses movement, but movement such as has no limit and is rather itself the limit of all other movement. A limit is a thing which contains; and this motion, being perfect, contains those imperfect motions which have a limit and a goal, having itself no beginning or end, but unceasing through the infinity of time, and of other movements, to some the cause of their beginning, to others offering the goal. The ancients gave to the Gods the heaven or upper place, as being alone immortal; and our present argument testifies that it is indestructible and ungenerated. Further, it is unaffected by any mortal discomfort, and, in addition, effortless; for it needs no constraining necessity to keep it to its path, and prevent it from moving with some other movement more natural to itself. Such a constrained movement would necessarily involve effort the more so, the more eternal it were – and would be inconsistent with perfection. Hence we must not believe the old tale which says that the world needs some Atlas to keep it safe – a tale composed, it would seem, by men who, like later thinkers, conceived of all the upper bodies as earthy and endowed with weight, and therefore supported it in their fabulous way upon animate necessity. We must no more believe that than follow Empedocles when he says that the world, by being whirled round, received a movement quick enough to overpower its own downward tendency, and thus has been kept from destruction all this time. Nor, again, is it conceivable that it should persist eternally by the necessitation of a soul. For a soul could not live in such conditions painlessly or happily, since the movement involves constraint, being imposed on the first body,

whose natural motion is different, and imposed continuously. It must therefore be uneasy and devoid of all rational satisfaction; for it could not even, like the soul of mortal animals, take recreation in the bodily relaxation of sleep. An Ixion's lot must needs possess it, without end or respite. If then, as we said, the view already stated of the first motion is a possible one, it is not only more appropriate so to conceive of its eternity, but also on this hypothesis alone are we able to advance a theory consistent with popular divinations of the divine nature. But of this enough for the present.

2

Since there are some who say that there is a right and a left in the heaven, with those who are known as Pythagoreans – to whom indeed the view really belongs – we must consider whether, if we are to apply these principles to the body of the universe, we should follow their statement of the matter or find a better way. At the start we may say that, if right and left are applicable, there are prior principles which must first be applied. These principles have been analysed in the discussion of the movements of animals, for the reason that they are proper to animal nature. For in some animals we find all such distinctions of parts as this of right and left clearly present, and in others some; but in plants we find only above and below. Now if we are to apply to the heaven such a distinction of parts, we must exect, as we have said, to find in it also the distinction which in animals is found first of them all. The distinctions are three, namely, above and below, front and its opposite, right and left – all these three oppositions we expect to find in the perfect body – and each may be called a principle. Above is the principle of length, right of breadth, front of depth. Or again we may connect them with the various movements, taking principle to mean that part, in a thing capable of movement, from which movement first begins. Growth starts from above, locomotion from the right, sensemovement from in front (for front is simply the part to which the senses are directed). Hence we must not look for above and below, right and left, front and

back, in every kind of body, but only in those which, being animate, have a principle of movement within themselves. For in no inanimate thing do we observe a part from which movement originates. Some do not move at all, some move, but not indifferently in any direction; fire, for example, only upward, and earth only to the centre. It is true that we speak of above and below, right and left, in these bodies relatively to ourselves. The reference may be to our own right hands, as with the diviner, or to some similarity to our own members, such as the parts of a statue possess; or we may take the contrary spatial order, calling right that which is to our left, and left that which is to our right. We observe, however, in the things themselves none of these distinctions; indeed if they are turned round we proceed to speak of the opposite parts as right and left, a boy land below, front and back. Hence it is remarkable that the Pythagoreans should have spoken of these two principles, right and left, only, to the exclusion of the other four, which have as good a title as they. There is no less difference between above and below or front and back in animals generally than between right and left. The difference is sometimes only one of function, sometimes also one of shape; and while the distinction of above and below is characteristic of all animate things, whether plants or animals, that of right and left is not found in plants. Further, inasmuch as length is prior to breadth, if above is the principle of length, right of breadth, and if the principle of that which is prior is itself prior, then above will be prior to right, or let us say, since 'prior' is ambiguous, prior in order of generation. If, in addition, above is the region from which movement originates, right the region in which it starts, front the region to which it is directed, then on this ground too above has a certain original character as compared with the other forms of position. On these two grounds, then, they may fairly be criticized, first, for omitting the more fundamental principles, and secondly, for thinking that the two they mentioned were attributable equally to everything.

Since we have already determined that functions of this kind belong to things which possess, a principle of movement, and that the heaven is animate and possesses a principle of movement, clearly the heaven must also exhibit above and below, right and left. We need not be troubled by the question, arising from the spherical shape of

the world, how there can be a distinction of right and left within it, all parts being alike and all for ever in motion. We must think of the world as of something in which right differs from left in shape as well as in other respects, which subsequently is included in a sphere. The difference of function will persist, but will appear not to by reason of the regularity of shape. In the same fashion must we conceive of the beginning of its movement. For even if it never began to move, yet it must possess a principle from which it would have begun to move if it had begun, and from which it would begin again if it came to a stand. Now by its length I mean the interval between its poles, one pole being above and the other below; for two hemispheres are specially distinguished from all others by the immobility of the poles. Further, by 'transverse' in the universe we commonly mean, not above and below, but a direction crossing the line of the poles, which, by implication, is length: for transverse motion is motion crossing motion up and down. Of the poles, that which we see above us is the lower region, and that which we do not see is the upper. For right in anything is, as we say, the region in which locomotion originates, and the rotation of the heaven originates in the region from which the stars rise. So this will be the right, and the region where they set the left. If then they begin from the right and move round to the right, the upper must be the unseen pole. For if it is the pole we see, the movement will be leftward, which we deny to be the fact. Clearly then the invisible pole is above. And those who live in the other hemisphere are above and to the right, while we are below and to the left. This is just the opposite of the view of the Pythagoreans, who make us above and on the right side and those in the other hemisphere below and on the left side; the fact being the exact opposite. Relatively, however, to the secondary revolution, I mean that of the planets, we are above and on the right and they are below and on the left. For the principle of their movement has the reverse position, since the movement itself is the contrary of the other: hence it follows that we are at its beginning and they at its end. Here we may end our discussion of the distinctions of parts created by the three dimensions and of the consequent differences of position.

3

Since circular motion is not the contrary of the reverse circular motion, we must consider why there is more than one motion, though we have to pursue our inquiries at a distance – a distance created not so much by our spatial position as by the fact that our senses enable us to perceive very few of the attributes of the heavenly bodies. But let not that deter us. The reason must be sought in the following facts. Everything which has a function exists for its function. The activity of God is immortality, i.e. eternal life. Therefore the movement of that which is divine must be eternal. But such is the heaven, viz. a divine body, and for that reason to it is given the circular body whose nature it is to move always in a circle. Why, then, is not the whole body of the heaven of the same character as that part? Because there must be something at rest at the centre of the revolving body; and of that body no part can be at rest, either elsewhere or at the centre. It could do so only if the body's natural movement were towards the centre. But the circular movement is natural, since otherwise it could not be eternal: for nothing unnatural is eternal. The unnatural is subsequent to the natural, being a derangement of the natural which occurs in the course of its generation. Earth then has to exist; for it is earth which is at rest at the centre. (At present we may take this for granted: it shall be explained later.) But if earth must exist, so must fire. For, if one of a pair of contraries naturally exists, the other, if it is really contrary, exists also naturally. In some form it must be present, since the matter of contraries is the same. Also, the positive is prior to its privation (warm, for instance, to cold), and rest and heaviness stand for the privation of lightness and movement. But further, if fire and earth exist, the intermediate bodies must exist also: each element stands in a contrary relation to every other. (This, again, we will here take for granted and try later to explain.) these four elements generation clearly is involved, since none of them can be eternal: for contraries interact with one another and destroy one another. Further, it is inconceivable that a movable body should be eternal, if its movement cannot be regarded as naturally eternal: and these

bodies we know to possess movement. Thus we see that generation is necessarily involved. But if so, there must be at least one other circular motion: for a single movement of the whole heaven would necessitate an identical relation of the elements of bodies to one another. This matter also shall be cleared up in what follows: but for the present so much is clear, that the reason why there is more than one circular body is the necessity of generation, which follows on the presence of fire, which, with that of the other bodies, follows on that of earth; and earth is required because eternal movement in one body necessitates eternal rest in another.

4

The shape of the heaven is of necessity spherical; for that is the shape most appropriate to its substance and also by nature primary.

First, let us consider generally which shape is primary among planes and solids alike. Every plane figure must be either rectilinear or curvilinear. Now the rectilinear is bounded by more than one line, the curvilinear by one only. But since in any kind the one is naturally prior to the many and the simple to the complex, the circle will be the first of plane figures. Again, if by complete, as previously defined, we mean a thing outside which no part of itself can be found, and if addition is always possible to the straight line but never to the circular, clearly the line which embraces the circle is complete. If then the complete is prior to the incomplete, it follows on this ground also that the circle is primary among figures. And the sphere holds the same position among solids. For it alone is embraced by a single surface, while rectilinear solids have several. The sphere is among solids what the circle is among plane figures. Further, those who divide bodies into planes and generate them out of planes seem to bear witness to the truth of this. Alone among solids they leave the sphere undivided, as not possessing more than one surface: for the division into surfaces is not just dividing a whole by cutting it into its

parts, but division of another fashion into parts different in form. It is clear, then, that the sphere is first of solid figures.

If, again, one orders figures according to their numbers, it is most natural to arrange them in this way. The circle corresponds to the number one, the triangle, being the sum of two right angles, to the number two. But if one is assigned to the triangle, the circle will not be a figure at all.

Now the first figure belongs to the first body, and the first body is that at the farthest circumference. It follows that the body which revolves with a circular movement must be spherical. The same then will be true of the body continuous with it: for that which is continuous with the spherical is spherical. The same again holds of the bodies between these and the centre. Bodies which are bounded by the spherical and in contact with it must be, as wholes, spherical; and the bodies below the sphere of the planets are contiguous with the sphere above them. The sphere then will be spherical throughout; for every body within it is contiguous and continuous with spheres.

Again, since the whole revolves, palpably and by assumption, in a circle, and since it has been shown that outside the farthest circumference there is neither void nor place, from these grounds also it will follow necessarily that the heaven is spherical. For if it is to be rectilinear in shape, it will follow that there is place and body and void without it. For a rectilinear figure as it revolves never continues in the same room, but where formerly was body, is now none, and where now is none, body will be in a moment because of the projection at the corners. Similarly, if the world had some other figure with unequal radii, if, for instance, it were lentiform, or oviform, in every case we should have to admit space and void outside the moving body, because the whole body would not always occupy the same room.

Again, if the motion of the heaven is the measure of all movements whatever in virtue of being alone continuous and regular and eternal, and if, in each kind, the measure is the minimum, and the minimum movement is the swiftest, then, clearly, the movement of the heaven must be the swiftest of all movements. Now of lines which return

upon themselves the line which bounds the circle is the shortest; and that movement is the swiftest which follows the shortest line. Therefore, if the heaven moves in a circle and moves more swiftly than anything else, it must necessarily be spherical.

Corroborative evidence may be drawn from the bodies whose position is about the centre. If earth is enclosed by water, water by air, air by fire, and these similarly by the upper bodies – which while not continuous are yet contiguous with them – and if the surface of water is spherical, and that which is continuous with or embraces the spherical must itself be spherical, then on these grounds also it is clear that the heavens are spherical. But the surface of water is seen to be spherical if we take as our starting-point the fact that water naturally tends to collect in a hollow place – 'hollow' meaning 'nearer the centre'. Draw from the centre the lines AB, AC, and let their extremities be joined by the straight line BC. The line AD, drawn to the base of the triangle, will be shorter than either of the radii. Therefore the place in which it terminates will be a hollow place. The water then will collect there until equality is established, that is until the line AE is equal to the two radii. Thus water forces its way to the ends of the radii, and there only will it rest: but the line which connects the extremities of the radii is circular: therefore the surface of the water BEC is spherical.

It is plain from the foregoing that the universe is spherical. It is plain, further, that it is turned (so to speak) with a finish which no manufactured thing nor anything else within the range of our observation can even approach. For the matter of which these are composed does not admit of anything like the same regularity and finish as the substance of the enveloping body; since with each step away from earth the matter manifestly becomes finer in the same proportion as water is finer than earth.

5

Now there are two ways of moving along a circle, from A to B or from A to C, and we have already explained that these movements are not contrary to one another. But nothing which concerns the eternal can be a matter of chance or spontaneity, and the heaven and its circular motion are eternal. We must therefore ask why this motion takes one direction and not the other. Either this is itself an ultimate fact or there is an ultimate fact behind it. It may seem evidence of excessive folly or excessive zeal to try to provide an explanation of some things, or of everything, admitting no exception. The criticism, however, is not always just: one should first consider what reason there is for speaking, and also what kind of certainty is looked for, whether human merely or of a more cogent kind. When any one shall succeed in finding proofs of greater precision, gratitude will be due to him for the discovery, but at present we must be content with a probable solution. If nature always follows the best course possible, and, just as upward movement is the superior form of rectilinear movement, since the upper region is more divine than the lower, so forward movement is superior to backward, then front and back exhibits, like right and left, as we said before and as the difficulty just stated itself suggests, the distinction of prior and posterior, which provides a reason and so solves our difficulty. Supposing that nature is ordered in the best way possible, this may stand as the reason of the fact mentioned. For it is best to move with a movement simple and unceasing, and, further, in the superior of two possible directions.

6

We have next to show that the movement of the heaven is regular and not irregular. This applies only to the first heaven and the first movement; for the lower spheres exhibit a composition of several movements into one. If the movement is uneven, clearly there will be acceleration, maximum speed, and retardation, since these appear in

all irregular motions. The maximum may occur either at the starting-point or at the goal or between the two; and we expect natural motion to reach its maximum at the goal, unnatural motion at the starting-point, and missiles midway between the two. But circular movement, having no beginning or limit or middle in the direct sense of the words, has neither whence nor whither nor middle: for in time it is eternal, and in length it returns upon itself without a break. If then its movement has no maximum, it can have no irregularity, since irregularity is produced by retardation and acceleration. Further, since everything that is moved is moved by something, the cause of the irregularity of movement must lie either in the mover or in the moved or both. For if the mover moved not always with the same force, or if the moved were altered and did not remain the same, or if both were to change, the result might well be an irregular movement in the moved. But none of these possibilities can be conceived as actual in the case of the heavens. As to that which is moved, we have shown that it is primary and simple and ungenerated and indestructible and generally unchanging; and the mover has an even better right to these attributes. It is the primary that moves the primary, the simple the simple, the indestructible and ungenerated that which is indestructible and ungenerated. Since then that which is moved, being a body, is nevertheless unchanging, how should the mover, which is incorporeal, be changed?

It follows then, further, that the motion cannot be irregular. For if irregularity occurs, there must be change either in the movement as a whole, from fast to slow and slow to fast, or in its parts. That there is no irregularity in the parts is obvious, since, if there were, some divergence of the stars would have taken place before now in the infinity of time, as one moved slower and another faster: but no alteration of their intervals is ever observed. Nor again is a change in the movement as a whole admissible. Retardation is always due to incapacity, and incapacity is unnatural. The incapacities of animals, age, decay, and the like, are all unnatural, due, it seems, to the fact that the whole animal complex is made up of materials which differ in respect of their proper places, and no single part occupies its own place. If therefore that which is primary contains nothing unnatural, being simple and unmixed and in its proper place and having no

contrary, then it has no place for incapacity, nor, consequently, for retardation or (since acceleration involves retardation) for acceleration. Again, it is inconceivable that the mover should first show incapacity for an infinite time, and capacity afterwards for another infinity. For clearly nothing which, like incapacity, unnatural ever continues for an infinity of time; nor does the unnatural endure as long as the natural, or any form of incapacity as long as the capacity. But if the movement is retarded it must necessarily be retarded for an infinite time. Equally impossible is perpetual acceleration or perpetual retardation. For such movement would be infinite and indefinite, but every movement, in our view, proceeds from one point to another and is definite in character. Again, suppose one assumes a minimum time in less than which the heaven could not complete its movement. For, as a given walk or a given exercise on the harp cannot take any and every time, but every performance has its definite minimum time which is unsurpassable, so, one might suppose, the movement of the heaven could not be completed in any and every time. But in that case perpetual acceleration is impossible (and, equally, perpetual retardation: for the argument holds of both and each), if we may take acceleration to proceed by identical or increasing additions of speed and for an infinite time. The remaining alternative is to say that the movement exhibits an alternation of slower and faster: but this is a mere fiction and quite inconceivable. Further, irregularity of this kind would be particularly unlikely to pass unobserved, since contrast makes observation easy.

That there is one heaven, then, only, and that it is ungenerated and eternal, and further that its movement is regular, has now been sufficiently explained.

7

We have next to speak of the stars, as they are called, of their composition, shape, and movements. It would be most natural and consequent upon what has been said that each of the stars should be

composed of that substance in which their path lies, since, as we said, there is an element whose natural movement is circular. In so saying we are only following the same line of thought as those who say that the stars are fiery because they believe the upper body to be fire, the presumption being that a thing is composed of the same stuff as that in which it is situated. The warmth and light which proceed from them are caused by the friction set up in the air by their motion. Movement tends to create fire in wood, stone, and iron; and with even more reason should it have that effect on air, a substance which is closer to fire than these. An example is that of missiles, which as they move are themselves fired so strongly that leaden balls are melted; and if they are fired the surrounding air must be similarly affected. Now while the missiles are heated by reason of their motion in air, which is turned into fire by the agitation produced by their movement, the upper bodies are carried on a moving sphere, so that, though they are not themselves fired, yet the air underneath the sphere of the revolving body is necessarily heated by its motion, and particularly in that part where the sun is attached to it. Hence warmth increases as the sun gets nearer or higher or overhead. Of the fact, then, that the stars are neither fiery nor move in fire, enough has been said.

8

Since changes evidently occur not only in the position of the stars but also in that of the whole heaven, there are three possibilities. Either (1) both are at rest, or (2) both are in motion, or (3) the one is at rest and the other in motion.

(1) That both should be at rest is impossible; for, if the earth is at rest, the hypothesis does not account for the observations; and we take it as granted that the earth is at rest. It remains either that both are moved, or that the one is moved and the other at rest.

(2) On the view, first, that both are in motion, we have the absurdity that the stars and the circles move with the same speed, i.e. that the ace of every star is that of the circle in it moves. For star and circle are seen to come back to the same place at the same moment; from which it follows that the star has traversed the circle and the circle has completed its own movement, i.e. traversed its own circumference, at one and the same moment. But it is difficult to conceive that the pace of each star should be exactly proportioned to the size of its circle. That the pace of each circle should be proportionate to its size is not absurd but inevitable: but that the same should be true of the movement of the stars contained in the circles is quite incredible. For if, on the one and, we suppose that the star which moves on the greater circle is necessarily swifter, clearly we also admit that if stars shifted their position so as to exchange circles, the slower would become swifter and the swifter slower. But this would show that their movement was not their own, but due to the circles. If, on the other hand, the arrangement was a chance combination, the coincidence in every case of a greater circle with a swifter movement of the star contained in it is too much to believe. In one or two cases it might not inconceivably fall out so, but to imagine it in every case alike is a mere fiction. Besides, chance has no place in that which is natural, and what happens everywhere and in every case is no matter of chance.

(3) The same absurdity is equally plain if it is supposed that the circles stand still and that it is the stars themselves which move. For it will follow that the outer stars are the swifter, and that the pace of the stars corresponds to the size of their circles.

Since, then, we cannot reasonably suppose either that both are in motion or that the star alone moves, the remaining alternative is that the circles should move, while the stars are at rest and move with the circles to which they are attached. Only on this supposition are we involved in no absurd consequence. For, in the first place, the quicker movement of the larger circle is natural when all the circles are attached to the same centre. Whenever bodies are moving with their proper motion, the larger moves quicker. It is the same here with the revolving bodies: for the are intercepted by two radii will be larger in

the larger circle, and hence it is not surprising that the revolution of the larger circle should take the same time as that of the smaller. And secondly, the fact that the heavens do not break in pieces follows not only from this but also from the proof already given of the continuity of the whole.

Again, since the stars are spherical, as our opponents assert and we may consistently admit, inasmuch as we construct them out of the spherical body, and since the spherical body has two movements proper to itself, namely rolling and spinning, it follows that if the stars have a movement of their own, it will be one of these. But neither is observed. (1) Suppose them to spin. They would then stay where they were, and not change their place, as, by observation and general consent, they do. Further, one would expect them all to exhibit the same movement: but the only star which appears to possess this movement is the sun, at sunrise or sunset, and this appearance is due not to the sun itself but to the distance from which we observe it. The visual ray being excessively prolonged becomes weak and wavering. The same reason probably accounts for the apparent twinkling of the fixed stars and the absence of twinkling in the planets. The planets are near, so that the visual ray reaches them in its full vigour, but when it comes to the fixed stars it is quivering because of the distance and its excessive extension; and its tremor produces an appearance of movement in the star: for it makes no difference whether movement is set up in the ray or in the object of vision.

(2) On the other hand, it is also clear that the stars do not roll. For rolling involves rotation: but the 'face', as it is called, of the moon is always seen. Therefore, since any movement of their own which the stars possessed would presumably be one proper to themselves, and no such movement is observed in them, clearly they have no movement of their own.

There is, further, the absurdity that nature has bestowed upon them no organ appropriate to such movement. For nature leaves nothing to chance, and would not, while caring for animals, overlook things so precious. Indeed, nature seems deliberately to have stripped them of

everything which makes selforiginated progression possible, and to have removed them as far as possible from things which have organs of movement. This is just why it seems proper that the whole heaven and every star should be spherical. For while of all shapes the sphere is the most convenient for movement in one place, making possible, as it does, the swiftest and most selfcontained motion, for forward movement it is the most unsuitable, least of all resembling shapes which are self-moved, in that it has no dependent or projecting part, as a rectilinear figure has, and is in fact as far as possible removed in shape from ambulatory bodies. Since, therefore, the heavens have to move in one lace, and the stars are not required to move themselves forward, it is natural that both should be spherical – a shape which best suits the movement of the one and the immobility of the other.

9

From all this it is clear that the theory that the movement of the stars produces a harmony, i.e. that the sounds they make are concordant, in spite of the grace and originality with which it has been stated, is nevertheless untrue. Some thinkers suppose that the motion of bodies of that size must produce a noise, since on our earth the motion of bodies far inferior in size and in speed of movement has that effect. Also, when the sun and the moon, they say, and all the stars, so great in number and in size, are moving with so rapid a motion, how should they not produce a sound immensely great? Starting from this argument and from the observation that their speeds, as measured by their distances, are in the same ratios as musical concordances, they assert that the sound given forth by the circular movement of the stars is a harmony. Since, however, it appears unaccountable that we should not hear this music, they explain this by saying that the sound is in our ears from the very moment of birth and is thus indistinguishable from its contrary silence, since sound and silence are discriminated by mutual contrast. What happens to men, then, is just what happens to coppersmiths, who are so accustomed to the noise of the smithy that

it makes no difference to them. But, as we said before, melodious and poetical as the theory is, it cannot be a true account of the facts. There is not only the absurdity of our hearing nothing, the ground of which they try to remove, but also the fact that no effect other than sensitive is produced upon us. Excessive noises, we know, shatter the solid bodies even of inanimate things: the noise of thunder, for instance, splits rocks and the strongest of bodies. But if the moving bodies are so great, and the sound which penetrates to us is proportionate to their size, that sound must needs reach us in an intensity many times that of thunder, and the force of its action must be immense. Indeed the reason why we do not hear, and show in our bodies none of the effects of violent force, is easily given: it is that there is no noise. But not only is the explanation evident; it is also a corroboration of the truth of the views we have advanced. For the very difficulty which made the Pythagoreans say that the motion of the stars produces a concord corroborates our view. Bodies which are themselves in motion, produce noise and friction: but those which are attached or fixed to a moving body, as the parts to a ship, can no more create noise, than a ship on a river moving with the stream. Yet by the same argument one might say it was absurd that on a large vessel the motion of mast and poop should not make a great noise, and the like might be said of the movement of the vessel itself. But sound is caused when a moving body is enclosed in an unmoved body, and cannot be caused by one enclosed in, and continuous with, a moving body which creates no friction. We may say, then, in this matter that if the heavenly bodies moved in a generally diffused mass of air or fire, as every one supposes, their motion would necessarily cause a noise of tremendous strength and such a noise would necessarily reach and shatter us. Since, therefore, this effect is evidently not produced, it follows that none of them can move with the motion either of animate nature or of constraint. It is as though nature had foreseen the result, that if their movement were other than it is, nothing on this earth could maintain its character.

That the stars are spherical and are not selfmoved, has now been explained.

10

With their order – I mean the position of each, as involving the priority of some and the posteriority of others, and their respective distances from the extremity – with this astronomy may be left to deal, since the astronomical discussion is adequate. This discussion shows that the movements of the several stars depend, as regards the varieties of speed which they exhibit, on the distance of each from the extremity. It is established that the outermost revolution of the heavens is a simple movement and the swiftest of all, and that the movement of all other bodies is composite and relatively slow, for the reason that each is moving on its own circle with the reverse motion to that of the heavens. This at once leads us to expect that the body which is nearest to that first simple revolution should take the longest time to complete its circle, and that which is farthest from it the shortest, the others taking a longer time the nearer they are and a shorter time the farther away they are. For it is the nearest body which is most strongly influenced, and the most remote, by reason of its distance, which is least affected, the influence on the intermediate bodies varying, as the mathematicians show, with their distance.

11

With regard to the shape of each star, the most reasonable view is that they are spherical. It has been shown that it is not in their nature to move themselves, and, since nature is no wanton or random creator, clearly she will have given things which possess no movement a shape particularly unadapted to movement. Such a shape is the sphere, since it possesses no instrument of movement. Clearly then their mass will have the form of a sphere. Again, what holds of one holds of all, and the evidence of our eyes shows us that the moon is spherical. For how else should the moon as it waxes and

wanes show for the most part a crescent-shaped or gibbous figure, and only at one moment a half-moon? And astronomical arguments give further confirmation; for no other hypothesis accounts for the crescent shape of the sun's eclipses. One, then, of the heavenly bodies being spherical, clearly the rest will be spherical also.

12

There are two difficulties, which may very reasonably here be raised, of which we must now attempt to state the probable solution: for we regard the zeal of one whose thirst after philosophy leads him to accept even slight indications where it is very difficult to see one's way, as a proof rather of modesty than of overconfidence.

Of many such problems one of the strangest is the problem why we find the greatest number of movements in the intermediate bodies, and not, rather, in each successive body a variety of movement proportionate to its distance from the primary motion. For we should expect, since the primary body shows one motion only, that the body which is nearest to it should move with the fewest movements, say two, and the one next after that with three, or some similar arrangement. But the opposite is the case. The movements of the sun and moon are fewer than those of some of the planets. Yet these planets are farther from the centre and thus nearer to the primary body than they, as observation has itself revealed. For we have seen the moon, half-full, pass beneath the planet Mars, which vanished on its shadow side and came forth by the bright and shining part. Similar accounts of other stars are given by the Egyptians and Babylonians, whose observations have been kept for very many years past, and from whom much of our evidence about particular stars is derived. A second difficulty which may with equal justice be raised is this. Why is it that the primary motion includes such a multitude of stars that their whole array seems to defy counting, while of the other stars each one is separated off, and in no case do we find two or more attached to the same motion?

On these questions, I say, it is well that we should seek to increase our understanding, though we have but little to go upon, and are placed at so great a distance from the facts in question. Nevertheless there are certain principles on which if we base our consideration we shall not find this difficulty by any means insoluble. We may object that we have been thinking of the stars as mere bodies, and as units with a serial order indeed but entirely inanimate; but should rather conceive them as enjoying life and action. On this view the facts cease to appear surprising. For it is natural that the best-conditioned of all things should have its good without action, that which is nearest to it should achieve it by little and simple action, and that which is farther removed by a complexity of actions, just as with men's bodies one is in good condition without exercise at all, another after a short walk, while another requires running and wrestling and hard training, and there are yet others who however hard they worked themselves could never secure this good, but only some substitute for it. To succeed often or in many things is difficult. For instance, to throw ten thousand Coan throws with the dice would be impossible, but to throw one or two is comparatively easy. In action, again, when A has to be done to get B, B to get C, and C to get D, one step or two present little difficulty, but as the series extends the difficulty grows. We must, then, think of the action of the lower stars as similar to that of animals and plants. For on our earth it is man that has the greatest variety of actions – for there are many goods that man can secure; hence his actions are various and directed to ends beyond them – while the perfectly conditioned has no need of action, since it is itself the end, and action always requires two terms, end and means. The lower animals have less variety of action than man; and plants perhaps have little action and of one kind only. For either they have but one attainable good (as indeed man has), or, if several, each contributes directly to their ultimate good. One thing then has and enjoys the ultimate good, other things attain to it, one immediately by few steps, another by many, while yet another does not even attempt to secure it but is satisfied to reach a point not far removed from that consummation. Thus, taking health as the end, there will be one thing that always possesses health, others that attain it, one by reducing flesh, another by running and thus reducing

flesh, another by taking steps to enable himself to run, thus further increasing the number of movements, while another cannot attain health itself, but only running or reduction of flesh, so that one or other of these is for such a being the end. For while it is clearly best for any being to attain the real end, yet, if that cannot be, the nearer it is to the best the better will be its state. It is for this reason that the earth moves not at all and the bodies near to it with few movements. For they do not attain the final end, but only come as near to it as their share in the divine principle permits. But the first heaven finds it immediately with a single movement, and the bodies intermediate between the first and last heavens attain it indeed, but at the cost of a multiplicity of movement.

As to the difficulty that into the one primary motion is crowded a vast multitude of stars, while of the other stars each has been separately given special movements of its own, there is in the first place this reason for regarding the arrangement as a natural one. In thinking of the life and moving principle of the several heavens one must regard the first as far superior to the others. Such a superiority would be reasonable. For this single first motion has to move many of the divine bodies, while the numerous other motions move only one each, since each single planet moves with a variety of motions. Thus, then, nature makes matters equal and establishes a certain order, giving to the single motion many bodies and to the single body many motions. And there is a second reason why the other motions have each only one body, in that each of them except the last, i.e. that which contains the one star, is really moving many bodies. For this last sphere moves with many others, to which it is fixed, each sphere being actually a body; so that its movement will be a joint product. Each sphere, in fact, has its particular natural motion, to which the general movement is, as it were, added. But the force of any limited body is only adequate to moving a limited body.

The characteristics of the stars which move with a circular motion, in respect of substance and shape, movement and order, have now been sufficiently explained.

13

It remains to speak of the earth, of its position, of the question whether it is at rest or in motion, and of its shape.

I. As to its position there is some difference of opinion. Most people – all, in fact, who regard the whole heaven as finite – say it lies at the centre. But the Italian philosophers known as Pythagoreans take the contrary view. At the centre, they say, is fire, and the earth is one of the stars, creating night and day by its circular motion about the centre. They further construct another earth in opposition to ours to which they give the name counterearth. In all this they are not seeking for theories and causes to account for observed facts, but rather forcing their observations and trying to accommodate them to certain theories and opinions of their own. But there are many others who would agree that it is wrong to give the earth the central position, looking for confirmation rather to theory than to the facts of observation. Their view is that the most precious place befits the most precious thing: but fire, they say, is more precious than earth, and the limit than the intermediate, and the circumference and the centre are limits. Reasoning on this basis they take the view that it is not earth that lies at the centre of the sphere, but rather fire. The Pythagoreans have a further reason. They hold that the most important part of the world, which is the centre, should be most strictly guarded, and name it, or rather the fire which occupies that place, the 'Guardhouse of Zeus', as if the word 'centre' were quite unequivocal, and the centre of the mathematical figure were always the same with that of the thing or the natural centre. But it is better to conceive of the case of the whole heaven as analogous to that of animals, in which the centre of the animal and that of the body are different. For this reason they have no need to be so disturbed about the world, or to call in a guard for its centre: rather let them look for the centre in the other sense and tell us what it is like and where nature has set it. That centre will be something primary and precious; but to the mere position we should give the last place rather than the first. For the middle is what is defined, and what defines it is the

limit, and that which contains or limits is more precious than that which is limited, see ing that the latter is the matter and the former the essence of the system.

II. As to the position of the earth, then, this is the view which some advance, and the views advanced concerning its rest or motion are similar. For here too there is no general agreement. All who deny that the earth lies at the centre think that it revolves about the centre, and not the earth only but, as we said before, the counter-earth as well. Some of them even consider it possible that there are several bodies so moving, which are invisible to us owing to the interposition of the earth. This, they say, accounts for the fact that eclipses of the moon are more frequent than eclipses of the sun: for in addition to the earth each of these moving bodies can obstruct it. Indeed, as in any case the surface of the earth is not actually a centre but distant from it a full hemisphere, there is no more difficulty, they think, in accounting for the observed facts on their view that we do not dwell at the centre, than on the common view that the earth is in the middle. Even as it is, there is nothing in the observations to suggest that we are removed from the centre by half the diameter of the earth. Others, again, say that the earth, which lies at the centre, is 'rolled', and thus in motion, about the axis of the whole heaven, So it stands written in the Timaeus.

III. There are similar disputes about the shape of the earth. Some think it is spherical, others that it is flat and drum-shaped. For evidence they bring the fact that, as the sun rises and sets, the part concealed by the earth shows a straight and not a curved edge, whereas if the earth were spherical the line of section would have to be circular. In this they leave out of account the great distance of the sun from the earth and the great size of the circumference, which, seen from a distance on these apparently small circles appears straight. Such an appearance ought not to make them doubt the circular shape of the earth. But they have another argument. They say that because it is at rest, the earth must necessarily have this shape. For there are many different ways in which the movement or rest of the earth has been conceived.

The difficulty must have occurred to every one. It would indeed be a complacent mind that felt no surprise that, while a little bit of earth, let loose in mid-air moves and will not stay still, and more there is of it the faster it moves, the whole earth, free in midair, should show no movement at all. Yet here is this great weight of earth, and it is at rest. And again, from beneath one of these moving fragments of earth, before it falls, take away the earth, and it will continue its downward movement with nothing to stop it. The difficulty then, has naturally passed into a common place of philosophy; and one may well wonder that the solutions offered are not seen to involve greater absurdities than the problem itself.

By these considerations some have been led to assert that the earth below us is infinite, saying, with Xenophanes of Colophon, that it has 'pushed its roots to infinity', – in order to save the trouble of seeking for the cause. Hence the sharp rebuke of Empedocles, in the words 'if the deeps of the earth are endless and endless the ample ether – such is the vain tale told by many a tongue, poured from the mouths of those who have seen but little of the whole. Others say the earth rests upon water. This, indeed, is the oldest theory that has been preserved, and is attributed to Thales of Miletus. It was supposed to stay still because it floated like wood and other similar substances, which are so constituted as to rest upon but not upon air. As if the same account had not to be given of the water which carries the earth as of the earth itself! It is not the nature of water, any more than of earth, to stay in mid-air: it must have something to rest upon. Again, as air is lighter than water, so is water than earth: how then can they think that the naturally lighter substance lies below the heavier? Again, if the earth as a whole is capable of floating upon water, that must obviously be the case with any part of it. But observation shows that this is not the case. Any piece of earth goes to the bottom, the quicker the larger it is. These thinkers seem to push their inquiries some way into the problem, but not so far as they might. It is what we are all inclined to do, to direct our inquiry not by the matter itself, but by the views of our opponents: and even when interrogating oneself one pushes the inquiry only to the point at which one can no longer offer any opposition. Hence a good inquirer will be one who is ready in bringing forward the objections proper to

the genus, and that he will be when he has gained an understanding of all the differences.

Anaximenes and Anaxagoras and Democritus give the flatness of the earth as the cause of its staying still. Thus, they say, it does not cut, but covers like a lid, the air beneath it. This seems to be the way of flat-shaped bodies: for even the wind can scarcely move them because of their power of resistance. The same immobility, they say, is produced by the flatness of the surface which the earth presents to the air which underlies it; while the air, not having room enough to change its place because it is underneath the earth, stays there in a mass, like the water in the case of the water-clock. And they adduce an amount of evidence to prove that air, when cut off and at rest, can bear a considerable weight.

Now, first, if the shape of the earth is not flat, its flatness cannot be the cause of its immobility. But in their own account it is rather the size of the earth than its flatness that causes it to remain at rest. For the reason why the air is so closely confined that it cannot find a passage, and therefore stays where it is, is its great amount: and this amount great because the body which isolates it, the earth, is very large. This result, then, will follow, even if the earth is spherical, so long as it retains its size. So far as their arguments go, the earth will still be at rest.

In general, our quarrel with those who speak of movement in this way cannot be confined to the parts; it concerns the whole universe. One must decide at the outset whether bodies have a natural movement or not, whether there is no natural but only constrained movement. Seeing, however, that we have already decided this matter to the best of our ability, we are entitled to treat our results as representing fact. Bodies, we say, which have no natural movement, have no constrained movement; and where there is no natural and no constrained movement there will be no movement at all. This is a conclusion, the necessity of which we have already decided, and we have seen further that rest also will be inconceivable, since rest, like movement, is either natural or constrained. But if there is any natural movement, constraint will not be the sole principle of motion or of

rest. If, then, it is by constraint that the earth now keeps its place, the so-called 'whirling' movement by which its parts came together at the centre was also constrained. (The form of causation supposed they all borrow from observations of liquids and of air, in which the larger and heavier bodies always move to the centre of the whirl. This is thought by all those who try to generate the heavens to explain why the earth came together at the centre. They then seek a reason for its staying there; and some say, in the manner explained, that the reason is its size and flatness, others, with Empedocles, that the motion of the heavens, moving about it at a higher speed, prevents movement of the earth, as the water in a cup, when the cup is given a circular motion, though it is often underneath the bronze, is for this same reason prevented from moving with the downward movement which is natural to it.) But suppose both the 'whirl' and its flatness (the air beneath being withdrawn) cease to prevent the earth's motion, where will the earth move to then? Its movement to the centre was constrained, and its rest at the centre is due to constraint; but there must be some motion which is natural to it. Will this be upward motion or downward or what? It must have some motion; and if upward and downward motion are alike to it, and the air above the earth does not prevent upward movement, then no more could air below it prevent downward movement. For the same cause must necessarily have the same effect on the same thing.

Further, against Empedocles there is another point which might be made. When the elements were separated off by Hate, what caused the earth to keep its place? Surely the 'whirl' cannot have been then also the cause. It is absurd too not to perceive that, while the whirling movement may have been responsible for the original coming together of the art of earth at the centre, the question remains, why now do all heavy bodies move to the earth. For the whirl surely does not come near us. Why, again, does fire move upward? Not, surely, because of the whirl. But if fire is naturally such as to move in a certain direction, clearly the same may be supposed to hold of earth. Again, it cannot be the whirl which determines the heavy and the light. Rather that movement caused the pre-existent heavy and light things to go to the middle and stay on the surface respectively. Thus, before ever the whirl began, heavy and light existed; and what can

have been the ground of their distinction, or the manner and direction of their natural movements? In the infinite chaos there can have been neither above nor below, and it is by these that heavy and light are determined.

It is to these causes that most writers pay attention: but there are some, Anaximander, for instance, among the ancients, who say that the earth keeps its place because of its indifference. Motion upward and downward and sideways were all, they thought, equally inappropriate to that which is set at the centre and indifferently related to every extreme point; and to move in contrary directions at the same time was impossible: so it must needs remain still. This view is ingenious but not true. The argument would prove that everything, whatever it be, which is put at the centre, must stay there. Fire, then, will rest at the centre: for the proof turns on no peculiar property of earth. But this does not follow. The observed facts about earth are not only that it remains at the centre, but also that it moves to the centre. The place to which any fragment of earth moves must necessarily be the place to which the whole moves; and in the place to which a thing naturally moves, it will naturally rest. The reason then is not in the fact that the earth is indifferently related to every extreme point: for this would apply to any body, whereas movement to the centre is peculiar to earth. Again it is absurd to look for a reason why the earth remains at the centre and not for a reason why fire remains at the extremity. If the extremity is the natural place of fire, clearly earth must also have a natural place. But suppose that the centre is not its place, and that the reason of its remaining there is this necessity of indifference – on the analogy of the hair which, it is said, however great the tension, will not break under it, if it be evenly distributed, or of the men who, though exceedingly hungry and thirsty, and both equally, yet being equidistant from food and drink, is therefore bound to stay where he is – even so, it still remains to explain why fire stays at the extremities. It is strange, too, to ask about things staying still but not about their motion, – why, I mean, one thing, if nothing stops it, moves up, and another thing to the centre. Again, their statements are not true. It happens, indeed, to be the case that a thing to which movement this way and that is equally inappropriate is obliged to remain at the centre. But so far as their

argument goes, instead of remaining there, it will move, only not as a mass but in fragments. For the argument applies equally to fire. Fire, if set at the centre, should stay there, like earth, since it will be indifferently related to every point on the extremity. Nevertheless it will move, as in fact it always does move when nothing stops it, away from the centre to the extremity. It will not, however, move in a mass to a single point on the circumference – the only possible result on the lines of the indifference theory – but rather each corresponding portion of fire to the corresponding part of the extremity, each fourth part, for instance, to a fourth part of the circumference. For since no body is a point, it will have parts. The expansion, when the body increased the place occupied, would be on the same principle as the contraction, in which the place was diminished. Thus, for all the indifference theory shows to the contrary, earth also would have moved in this manner away from the centre, unless the centre had been its natural place.

We have now outlined the views held as to the shape, position, and rest or movement of the earth.

14

Let us first decide the question whether the earth moves or is at rest. For, as we said, there are some who make it one of the stars, and others who, setting it at the centre, suppose it to be 'rolled' and in motion about the pole as axis. That both views are untenable will be clear if we take as our starting-point the fact that the earth's motion, whether the earth be at the centre or away from it, must needs be a constrained motion. It cannot be the movement of the earth itself. If it were, any portion of it would have this movement; but in fact every part moves in a straight line to the centre. Being, then, constrained and unnatural, the movement could not be eternal. But the order of the universe is eternal. Again, everything that moves with the circular movement, except the first sphere, is observed to be passed, and to move with more than one motion. The earth, then, also,

whether it move about the centre or as stationary at it, must necessarily move with two motions. But if this were so, there would have to be passings and turnings of the fixed stars. Yet no such thing is observed. The same stars always rise and set in the same parts of the earth.

Further, the natural movement of the earth, part and whole alike, is the centre of the whole – whence the fact that it is now actually situated at the centre – but it might be questioned since both centres are the same, which centre it is that portions of earth and other heavy things move to. Is this their goal because it is the centre of the earth or because it is the centre of the whole? The goal, surely, must be the centre of the whole. For fire and other light things move to the extremity of the area which contains the centre. It happens, however, that the centre of the earth and of the whole is the same. Thus they do move to the centre of the earth, but accidentally, in virtue of the fact that the earth's centre lies at the centre of the whole. That the centre of the earth is the goal of their movement is indicated by the fact that heavy bodies moving towards the earth do not parallel but so as to make equal angles, and thus to a single centre, that of the earth. It is clear, then, that the earth must be at the centre and immovable, not only for the reasons already given, but also because heavy bodies forcibly thrown quite straight upward return to the point from which they started, even if they are thrown to an infinite distance. From these considerations then it is clear that the earth does not move and does not lie elsewhere than at the centre.

From what we have said the explanation of the earth's immobility is also apparent. If it is the nature of earth, as observation shows, to move from any point to the centre, as of fire contrariwise to move from the centre to the extremity, it is impossible that any portion of earth should move away from the centre except by constraint. For a single thing has a single movement, and a simple thing a simple: contrary movements cannot belong to the same thing, and movement away from the centre is the contrary of movement to it. If then no portion of earth can move away from the centre, obviously still less can the earth as a whole so move. For it is the nature of the whole to move to the point to which the part naturally moves. Since,

then, it would require a force greater than itself to move it, it must needs stay at the centre. This view is further supported by the contributions of mathematicians to astronomy, since the observations made as the shapes change by which the order of the stars is determined, are fully accounted for on the hypothesis that the earth lies at the centre. Of the position of the earth and of the manner of its rest or movement, our discussion may here end.

Its shape must necessarily be spherical. For every portion of earth has weight until it reaches the centre, and the jostling of parts greater and smaller would bring about not a waved surface, but rather compression and convergence of part and part until the centre is reached. The process should be conceived by supposing the earth to come into being in the way that some of the natural philosophers describe. Only they attribute the downward movement to constraint, and it is better to keep to the truth and say that the reason of this motion is that a thing which possesses weight is naturally endowed with a centripetal movement. When the mixture, then, was merely potential, the things that were separated off moved similarly from every side towards the centre. Whether the parts which came together at the centre were distributed at the extremities evenly, or in some other way, makes no difference. If, on the one hand, there were a similar movement from each quarter of the extremity to the single centre, it is obvious that the resulting mass would be similar on every side. For if an equal amount is added on every side the extremity of the mass will be everywhere equidistant from its centre, i.e. the figure will be spherical. But neither will it in any way affect the argument if there is not a similar accession of concurrent fragments from every side. For the greater quantity, finding a lesser in front of it, must necessarily drive it on, both having an impulse whose goal is the centre, and the greater weight driving the lesser forward till this goal is reached. In this we have also the solution of a possible difficulty. The earth, it might be argued, is at the centre and spherical in shape: if, then, a weight many times that of the earth were added to one hemisphere, the centre of the earth and of the whole will no longer be coincident. So that either the earth will not stay still at the centre, or if it does, it will be at rest without having its centre at the place to which it is still its nature to move. Such is the difficulty. A

short consideration will give us an easy answer, if we first give precision to our postulate that any body endowed with weight, of whatever size, moves towards the centre. Clearly it will not stop when its edge touches the centre. The greater quantity must prevail until the body's centre occupies the centre. For that is the goal of its impulse. Now it makes no difference whether we apply this to a clod or common fragment of earth or to the earth as a whole. The fact indicated does not depend upon degrees of size but applies universally to everything that has the centripetal impulse. Therefore earth in motion, whether in a mass or in fragments, necessarily continues to move until it occupies the centre equally every way, the less being forced to equalize itself by the greater owing to the forward drive of the impulse.

If the earth was generated, then, it must have been formed in this way, and so clearly its generation was spherical; and if it is ungenerated and has remained so always, its character must be that which the initial generation, if it had occurred, would have given it. But the spherical shape, necessitated by this argument, follows also from the fact that the motions of heavy bodies always make equal angles, and are not parallel. This would be the natural form of movement towards what is naturally spherical. Either then the earth is spherical or it is at least naturally spherical. And it is right to call anything that which nature intends it to be, and which belongs to it, rather than that which it is by constraint and contrary to nature. The evidence of the senses further corroborates this. How else would eclipses of the moon show segments shaped as we see them? As it is, the shapes which the moon itself each month shows are of every kind straight, gibbous, and concave – but in eclipses the outline is always curved: and, since it is the interposition of the earth that makes the eclipse, the form of this line will be caused by the form of the earth's surface, which is therefore spherical. Again, our observations of the stars make it evident, not only that the earth is circular, but also that it is a circle of no great size. For quite a small change of position to south or north causes a manifest alteration of the horizon. There is much change, I mean, in the stars which are overhead, and the stars seen are different, as one moves northward or southward. Indeed there are some stars seen in Egypt and in the

neighbourhood of Cyprus which are not seen in the northerly regions; and stars, which in the north are never beyond the range of observation, in those regions rise and set. All of which goes to show not only that the earth is circular in shape, but also that it is a sphere of no great size: for otherwise the effect of so slight a change of place would not be quickly apparent. Hence one should not be too sure of the incredibility of the view of those who conceive that there is continuity between the parts about the pillars of Hercules and the parts about India, and that in this way the ocean is one. As further evidence in favour of this they quote the case of elephants, a species occurring in each of these extreme regions, suggesting that the common characteristic of these extremes is explained by their continuity. Also, those mathematicians who try to calculate the size of the earth's circumference arrive at the figure 400,000 stades. This indicates not only that the earth's mass is spherical in shape, but also that as compared with the stars it is not of great size.

Book III

1

We have already discussed the first heaven and its parts, the moving stars within it, the matter of which these are composed and their bodily constitution, and we have also shown that they are ungenerated and indestructible. Now things that we call natural are either substances or functions and attributes of substances. As substances I class the simple bodies – fire, earth, and the other terms of the series – and all things composed of them; for example, the heaven as a whole and its parts, animals, again, and plants and their parts. By attributes and functions I mean the movements of these

and of all other things in which they have power in themselves to cause movement, and also their alterations and reciprocal transformations. It is obvious, then, that the greater part of the inquiry into nature concerns bodies: for a natural substance is either a body or a thing which cannot come into existence without body and magnitude. This appears plainly from an analysis of the character of natural things, and equally from an inspection of the instances of inquiry into nature. Since, then, we have spoken of the primary element, of its bodily constitution, and of its freedom from destruction and generation, it remains to speak of the other two. In speaking of them we shall be obliged also to inquire into generation and destruction. For if there is generation anywhere, it must be in these elements and things composed of them.

This is indeed the first question we have to ask: is generation a fact or not? Earlier speculation was at variance both with itself and with the views here put forward as to the true answer to this question. Some removed generation and destruction from the world altogether. Nothing that is, they said, is generated or destroyed, and our conviction to the contrary is an illusion. So maintained the school of Melissus and Parmenides. But however excellent their theories may otherwise be, anyhow they cannot be held to speak as students of nature. There may be things not subject to generation or any kind of movement, but if so they belong to another and a higher inquiry than the study of nature. They, however, had no idea of any form of being other than the substance of things perceived; and when they saw, what no one previously had seen, that there could be no knowledge or wisdom without some such unchanging entities, they naturally transferred what was true of them to things perceived. Others, perhaps intentionally, maintain precisely the contrary opinion to this. It has been asserted that everything in the world was subject to generation and nothing was ungenerated, but that after being generated some things remained indestructible while the rest were again destroyed. This had been asserted in the first instance by Hesiod and his followers, but afterwards outside his circle by the earliest natural philosophers. But what these thinkers maintained was that all else has been generated and, as they said, 'is flowing away, nothing having any solidity, except one single thing which

persists as the basis of all these transformations. So we may interpret the statements of Heraclitus of Ephesus and many others. And some subject all bodies whatever to generation, by means of the composition and separation of planes.

Discussion of the other views may be postponed. But this last theory which composes every body of planes is, as the most superficial observation shows, in many respects in plain contradiction with mathematics. It is, however, wrong to remove the foundations of a science unless you can replace them with others more convincing. And, secondly, the same theory which composes solids of planes clearly composes planes of lines and lines of points, so that a part of a line need not be a line. This matter has been already considered in our discussion of movement, where we have shown that an indivisible length is impossible. But with respect to natural bodies there are impossibilities involved in the view which asserts indivisible lines, which we may briefly consider at this point. For the impossible consequences which result from this view in the mathematical sphere will reproduce themselves when it is applied to physical bodies, but there will be difficulties in physics which are not present in mathematics; for mathematics deals with an abstract and physics with a more concrete object. There are many attributes necessarily present in physical bodies which are necessarily excluded by indivisibility; all attributes, in fact, which are divisible. There can be nothing divisible in an indivisible thing, but the attributes of bodies are all divisible in one of two ways. They are divisible into kinds, as colour is divided into white and black, and they are divisible per accidens when that which has them is divisible. In this latter sense attributes which are simple are nevertheless divisible. Attributes of this kind will serve, therefore, to illustrate the impossibility of the view. It is impossible, if two parts of a thing have no weight, that the two together should have weight. But either all perceptible bodies or some, such as earth and water, have weight, as these thinkers would themselves admit. Now if the point has no weight, clearly the lines have not either, and, if they have not, neither have the planes. Therefore no body has weight. It is, further, manifest that their point cannot have weight. For while a heavy thing may always be heavier than something and a light thing lighter than

something, a thing which is heavier or lighter than something need not be itself heavy or light, just as a large thing is larger than others, but what is larger is not always large. A thing which, judged absolutely, is small may none the less be larger than other things. Whatever, then, is heavy and also heavier than something else, must exceed this by something which is heavy. A heavy thing therefore is always divisible. But it is common ground that a point is indivisible. Again, suppose that what is heavy or weight is a dense body, and what is light rare. Dense differs from rare in containing more matter in the same cubic area. A point, then, if it may be heavy or light, may be dense or rare. But the dense is divisible while a point is indivisible. And if what is heavy must be either hard or soft, an impossible consequence is easy to draw. For a thing is soft if its surface can be pressed in, hard if it cannot; and if it can be pressed in it is divisible.

Moreover, no weight can consist of parts not possessing weight. For how, except by the merest fiction, can they specify the number and character of the parts which will produce weight? And, further, when one weight is greater than another, the difference is a third weight; from which it will follow that every indivisible part possesses weight. For suppose that a body of four points possesses weight. A body composed of more than four points will superior in weight to it, a thing which has weight. But the difference between weight and weight must be a weight, as the difference between white and whiter is white. Here the difference which makes the superior weight heavier is the single point which remains when the common number, four, is subtracted. A single point, therefore, has weight.

Further, to assume, on the one hand, that the planes can only be put in linear contact would be ridiculous. For just as there are two ways of putting lines together, namely, end to and side by side, so there must be two ways of putting planes together. Lines can be put together so that contact is linear by laying one along the other, though not by putting them end to end. But if, similarly, in putting the lanes together, superficial contact is allowed as an alternative to linear, that method will give them bodies which are not any element nor composed of elements. Again, if it is the number of planes in a body that makes one heavier than another, as the Timaeus explains,

clearly the line and the point will have weight. For the three cases are, as we said before, analogous. But if the reason of differences of weight is not this, but rather the heaviness of earth and the lightness of fire, then some of the planes will be light and others heavy (which involves a similar distinction in the lines and the points); the earthplane, I mean, will be heavier than the fire-plane. In general, the result is either that there is no magnitude at all, or that all magnitude could be done away with. For a point is to a line as a line is to a plane and as a plane is to a body. Now the various forms in passing into one another will each be resolved into its ultimate constituents. It might happen therefore that nothing existed except points, and that there was no body at all. A further consideration is that if time is similarly constituted, there would be, or might be, a time at which it was done away with. For the indivisible now is like a point in a line. The same consequences follow from composing the heaven of numbers, as some of the Pythagoreans do who make all nature out of numbers. For natural bodies are manifestly endowed with weight and lightness, but an assemblage of units can neither be composed to form a body nor possess weight.

2

The necessity that each of the simple bodies should have a natural movement may be shown as follows. They manifestly move, and if they have no proper movement they must move by constraint: and the constrained is the same as the unnatural. Now an unnatural movement presupposes a natural movement which it contravenes, and which, however many the unnatural movements, is always one. For naturally a thing moves in one way, while its unnatural movements are manifold. The same may be shown, from the fact of rest. Rest, also, must either be constrained or natural, constrained in a place to which movement was constrained, natural in a place movement to which was natural. Now manifestly there is a body which is at rest at the centre. If then this rest is natural to it, clearly motion to this place is natural to it. If, on the other hand, its rest is

constrained, what is hindering its motion? Something, which is at rest: but if so, we shall simply repeat the same argument; and either we shall come to an ultimate something to which rest where it is or we shall have an infinite process, which is impossible. The hindrance to its movement, then, we will suppose, is a moving thing – as Empedocles says that it is the vortex which keeps the earth still – : but in that case we ask, where would it have moved to but for the vortex? It could not move infinitely; for to traverse an infinite is impossible, and impossibilities do not happen. So the moving thing must stop somewhere, and there rest not by constraint but naturally. But a natural rest proves a natural movement to the place of rest. Hence Leucippus and Democritus, who say that the primary bodies are in perpetual movement in the void or infinite, may be asked to explain the manner of their motion and the kind of movement which is natural to them. For if the various elements are constrained by one another to move as they do, each must still have a natural movement which the constrained contravenes, and the prime mover must cause motion not by constraint but naturally. If there is no ultimate natural cause of movement and each preceding term in the series is always moved by constraint, we shall have an infinite process. The same difficulty is involved even if it is supposed, as we read in the Timaeus, that before the ordered world was made the elements moved without order. Their movement must have been due either to constraint or to their nature. And if their movement was natural, a moment's consideration shows that there was already an ordered world. For the prime mover must cause motion in virtue of its own natural movement, and the other bodies, moving without constraint, as they came to rest in their proper places, would fall into the order in which they now stand, the heavy bodies moving towards the centre and the light bodies away from it. But that is the order of their distribution in our world. There is a further question, too, which might be asked. Is it possible or impossible that bodies in unordered movement should combine in some cases into combinations like those of which bodies of nature's composing are composed, such, I mean, as bones and flesh? Yet this is what Empedocles asserts to have occurred under Love. 'Many a head', says he, 'came to birth without a neck.' The answer to the view that there are infinite bodies moving in an infinite

is that, if the cause of movement is single, they must move with a single motion, and therefore not without order; and if, on the other hand, the causes are of infinite variety, their motions too must be infinitely varied. For a finite number of causes would produce a kind of order, since absence of order is not proved by diversity of direction in motions: indeed, in the world we know, not all bodies, but only bodies of the same kind, have a common goal of movement. Again, disorderly movement means in reality unnatural movement, since the order proper to perceptible things is their nature. And there is also absurdity and impossibility in the notion that the disorderly movement is infinitely continued. For the nature of things is the nature which most of them possess for most of the time. Thus their view brings them into the contrary position that disorder is natural, and order or system unnatural. But no natural fact can originate in chance. This is a point which Anaxagoras seems to have thoroughly grasped; for he starts his cosmogony from unmoved things. The others, it is true, make things collect together somehow before they try to produce motion and separation. But there is no sense in starting generation from an original state in which bodies are separated and in movement. Hence Empedocles begins after the process ruled by Love: for he could not have constructed the heaven by building it up out of bodies in separation, making them to combine by the power of Love, since our world has its constituent elements in separation, and therefore presupposes a previous state of unity and combination.

These arguments make it plain that every body has its natural movement, which is not constrained or contrary to its nature. We go on to show that there are certain bodies whose necessary impetus is that of weight and lightness. Of necessity, we assert, they must move, and a moved thing which has no natural impetus cannot move either towards or away from the centre. Suppose a body A without weight, and a body B endowed with weight. Suppose the weightless body to move the distance CD, while B in the same time moves the distance CE, which will be greater since the heavy thing must move further. Let the heavy body then be divided in the proportion CE: CD (for there is no reason why a part of B should not stand in this relation to the whole). Now if the whole moves the whole distance CE, the part must

in the same time move the distance CD. A weightless body, therefore, and one which has weight will move the same distance, which is impossible. And the same argument would fit the case of lightness. Again, a body which is in motion but has neither weight nor lightness, must be moved by constraint, and must continue its constrained movement infinitely. For there will be a force which moves it, and the smaller and lighter a body is the further will a given force move it. Now let A, the weightless body, be moved the distance CE, and B, which has weight, be moved in the same time the distance CD. Dividing the heavy body in the proportion CE:CD, we subtract from the heavy body a part which will in the same time move the distance CE, since the whole moved CD: for the relative speeds of the two bodies will be in inverse ratio to their respective sizes. Thus the weightless body will move the same distance as the heavy in the same time. But this is impossible. Hence, since the motion of the weightless body will cover a greater distance than any that is suggested, it will continue infinitely. It is therefore obvious that every body must have a definite weight or lightness. But since 'nature' means a source of movement within the thing itself, while a force is a source of movement in something other than it or in itself qua other, and since movement is always due either to nature or to constraint, movement which is natural, as downward movement is to a stone, will be merely accelerated by an external force, while an unnatural movement will be due to the force alone. In either case the air is as it were instrumental to the force. For air is both light and heavy, and thus qua light produces upward motion, being propelled and set in motion by the force, and qua heavy produces a downward motion. In either case the force transmits the movement to the body by first, as it were, impregnating the air. That is why a body moved by constraint continues to move when that which gave the impulse ceases to accompany it. Otherwise, i.e. if the air were not endowed with this function, constrained movement would be impossible. And the natural movement of a body may be helped on in the same way. This discussion suffices to show (1) that all bodies are either light or heavy, and (2) how unnatural movement takes place.

From what has been said earlier it is plain that there cannot be generation either of everything or in an absolute sense of anything. It

is impossible that everything should be generated, unless an extra-corporeal void is possible. For, assuming generation, the place which is to be occupied by that which is coming to be, must have been previously occupied by void in which no body was. Now it is quite possible for one body to be generated out of another, air for instance out of fire, but in the absence of any pre-existing mass generation is impossible. That which is potentially a certain kind of body may, it is true, become such in actuality, But if the potential body was not already in actuality some other kind of body, the existence of an extra-corporeal void must be admitted.

3

It remains to say what bodies are subject to generation, and why. Since in every case knowledge depends on what is primary, and the elements are the primary constituents of bodies, we must ask which of such bodies are elements, and why; and after that what is their number and character. The answer will be plain if we first explain what kind of substance an element is. An element, we take it, is a body into which other bodies may be analysed, present in them potentially or in actuality (which of these, is still disputable), and not itself divisible into bodies different in form. That, or something like it, is what all men in every case mean by element. Now if what we have described is an element, clearly there must be such bodies. For flesh and wood and all other similar bodies contain potentially fire and earth, since one sees these elements exuded from them; and, on the other hand, neither in potentiality nor in actuality does fire contain flesh or wood, or it would exude them. Similarly, even if there were only one elementary body, it would not contain them. For though it will be either flesh or bone or something else, that does not at once show that it contained these in potentiality: the further question remains, in what manner it becomes them. Now Anaxagoras opposes Empedocles' view of the elements. Empedocles says that fire and earth and the related bodies are elementary bodies of which all things are composed; but this Anaxagoras denies. His elements are

the homoeomerous things, viz. flesh, bone, and the like. Earth and fire are mixtures, composed of them and all the other seeds, each consisting of a collection of all the homoeomerous bodies, separately invisible; and that explains why from these two bodies all others are generated. (To him fire and aither are the same thing.) But since every natural body has it proper movement, and movements are either simple or mixed, mixed in mixed bodies and simple in simple, there must obviously be simple bodies; for there are simple movements. It is plain, then, that there are elements, and why.

4

The next question to consider is whether the elements are finite or infinite in number, and, if finite, what their number is. Let us first show reason or denying that their number is infinite, as some suppose. We begin with the view of Anaxagoras that all the homoeomerous bodies are elements. Any one who adopts this view misapprehends the meaning of element. Observation shows that even mixed bodies are often divisible into homoeomerous parts; examples are flesh, bone, wood, and stone. Since then the composite cannot be an element, not every homoeomerous body can be an element; only, as we said before, that which is not divisible into bodies different in form. But even taking 'element' as they do, they need not assert an infinity of elements, since the hypothesis of a finite number will give identical results. Indeed even two or three such bodies serve the purpose as well, as Empedocles' attempt shows. Again, even on their view it turns out that all things are not composed of homocomerous bodies. They do not pretend that a face is composed of faces, or that any other natural conformation is composed of parts like itself. Obviously then it would be better to assume a finite number of principles. They should, in fact, be as few as possible, consistently with proving what has to be proved. This is the common demand of mathematicians, who always assume as principles things finite either in kind or in number. Again, if body is distinguished from body by the appropriate qualitative difference,

and there is a limit to the number of differences (for the difference lies in qualities apprehended by sense, which are in fact finite in number, though this requires proof), then manifestly there is necessarily a limit to the number of elements.

There is, further, another view – that of Leucippus and Democritus of Abdera – the implications of which are also unacceptable. The primary masses, according to them, are infinite in number and indivisible in mass: one cannot turn into many nor many into one; and all things are generated by their combination and involution. Now this view in a sense makes things out to be numbers or composed of numbers. The exposition is not clear, but this is its real meaning. And further, they say that since the atomic bodies differ in shape, and there is an infinity of shapes, there is an infinity of simple bodies. But they have never explained in detail the shapes of the various elements, except so far to allot the sphere to fire. Air, water, and the rest they distinguished by the relative size of the atom, assuming that the atomic substance was a sort of master-seed for each and every element. Now, in the first place, they make the mistake already noticed. The principles which they assume are not limited in number, though such limitation would necessitate no other alteration in their theory. Further, if the differences of bodies are not infinite, plainly the elements will not be an infinity. Besides, a view which asserts atomic bodies must needs come into conflict with the mathematical sciences, in addition to invalidating many common opinions and apparent data of sense perception. But of these things we have already spoken in our discussion of time and movement. They are also bound to contradict themselves. For if the elements are atomic, air, earth, and water cannot be differentiated by the relative sizes of their atoms, since then they could not be generated out of one another. The extrusion of the largest atoms is a process that will in time exhaust the supply; and it is by such a process that they account for the generation of water, air, and earth from one another. Again, even on their own presuppositions it does not seem as if the clements would be infinite in number. The atoms differ in figure, and all figures are composed of pyramids, rectilinear the case of rectilinear figures, while the sphere has eight pyramidal parts. The figures must have their principles, and, whether these are one or two

or more, the simple bodies must be the same in number as they. Again, if every element has its proper movement, and a simple body has a simple movement, and the number of simple movements is not infinite, because the simple motions are only two and the number of places is not infinite, on these grounds also we should have to deny that the number of elements is infinite.

5

Since the number of the elements must be limited, it remains to inquire whether there is more than one element. Some assume one only, which is according to some water, to others air, to others fire, to others again something finer than water and denser than air, an infinite body – so they say – bracing all the heavens.

Now those who decide for a single element, which is either water or air or a body finer than water and denser than air, and proceed to generate other things out of it by use of the attributes density and rarity, all alike fail to observe the fact that they are depriving the element of its priority. Generation out of the elements is, as they say, synthesis, and generation into the elements is analysis, so that the body with the finer parts must have priority in the order of nature. But they say that fire is of all bodies the finest. Hence fire will be first in the natural order. And whether the finest body is fire or not makes no difference; anyhow it must be one of the other bodies that is primary and not that which is intermediate. Again, density and rarity, as instruments of generation, are equivalent to fineness and coarseness, since the fine is rare, and coarse in their use means dense. But fineness and coarseness, again, are equivalent to greatness and smallness, since a thing with small parts is fine and a thing with large parts coarse. For that which spreads itself out widely is fine, and a thing composed of small parts is so spread out. In the end, then, they distinguish the various other substances from the element by the greatness and smallness of their parts. This method of distinction makes all judgement relative. There will be no absolute

distinction between fire, water, and air, but one and the same body will be relatively to this fire, relatively to something else air. The same difficulty is involved equally in the view elements and distinguishes them by their greatness and smallness. The principle of distinction between bodies being quantity, the various sizes will be in a definite ratio, and whatever bodies are in this ratio to one another must be air, fire, earth, and water respectively. For the ratios of smaller bodies may be repeated among greater bodies.

Those who start from fire as the single element, while avoiding this difficulty, involve themselves in many others. Some of them give fire a particular shape, like those who make it a pyramid, and this on one of two grounds. The reason given may be – more crudely – that the pyramid is the most piercing of figures as fire is of bodies, or – more ingeniously – the position may be supported by the following argument. As all bodies are composed of that which has the finest parts, so all solid figures are composed of pryamids: but the finest body is fire, while among figures the pyramid is primary and has the smallest parts; and the primary body must have the primary figure: therefore fire will be a pyramid. Others, again, express no opinion on the subject of its figure, but simply regard it as the of the finest parts, which in combination will form other bodies, as the fusing of gold-dust produces solid gold. Both of these views involve the same difficulties. For (1) if, on the one hand, they make the primary body an atom, the view will be open to the objections already advanced against the atomic theory. And further the theory is inconsistent with a regard for the facts of nature. For if all bodies are quantitatively commensurable, and the relative size of the various homoeomerous masses and of their several elements are in the same ratio, so that the total mass of water, for instance, is related to the total mass of air as the elements of each are to one another, and so on, and if there is more air than water and, generally, more of the finer body than of the coarser, obviously the element of water will be smaller than that of air. But the lesser quantity is contained in the greater. Therefore the air element is divisible. And the same could be shown of fire and of all bodies whose parts are relatively fine. (2) If, on the other hand, the primary body is divisible, then (a) those who give fire a special shape will have to say that a part of fire is not fire, because a pyramid is not

composed of pyramids, and also that not every body is either an element or composed of elements, since a part of fire will be neither fire nor any other element. And (b) those whose ground of distinction is size will have to recognize an element prior to the element, a regress which continues infinitely, since every body is divisible and that which has the smallest parts is the element. Further, they too will have to say that the same body is relatively to this fire and relatively to that air, to others again water and earth.

The common error of all views which assume a single element is that they allow only one natural movement, which is the same for every body. For it is a matter of observation that a natural body possesses a principle of movement. If then all bodies are one, all will have one movement. With this motion the greater their quantity the more they will move, just as fire, in proportion as its quantity is greater, moves faster with the upward motion which belongs to it. But the fact is that increase of quantity makes many things move the faster downward. For these reasons, then, as well as from the distinction already established of a plurality of natural movements, it is impossible that there should be only one element. But if the elements are not an infinity and not reducible to one, they must be several and finite in number.

6

First we must inquire whether the elements are eternal or subject to generation and destruction; for when this question has been answered their number and character will be manifest. In the first place, they cannot be eternal. It is a matter of observation that fire, water, and every simple body undergo a process of analysis, which must either continue infinitely or stop somewhere. (1) Suppose it infinite. Then the time occupied by the process will be infinite, and also that occupied by the reverse process of synthesis. For the processes of analysis and synthesis succeed one another in the various parts. It will follow that there are two infinite times which are

mutually exclusive, the time occupied by the synthesis, which is infinite, being preceded by the period of analysis. There are thus two mutually exclusive infinites, which is impossible. (2) Suppose, on the other hand, that the analysis stops somewhere. Then the body at which it stops will be either atomic or, as Empedocles seems to have intended, a divisible body which will yet never be divided. The foregoing arguments show that it cannot be an atom; but neither can it be a divisible body which analysis will never reach. For a smaller body is more easily destroyed than a larger; and a destructive process which succeeds in destroying, that is, in resolving into smaller bodies, a body of some size, cannot reasonably be expected to fail with the smaller body. Now in fire we observe a destruction of two kinds: it is destroyed by its contrary when it is quenched, and by itself when it dies out. But the effect is produced by a greater quantity upon a lesser, and the more quickly the smaller it is. The elements of bodies must therefore be subject to destruction and generation.

Since they are generated, they must be generated either from something incorporeal or from a body, and if from a body, either from one another or from something else. The theory which generates them from something incorporeal requires an extra-corporeal void. For everything that comes to be comes to be in something, and that in which the generation takes place must either be incorporeal or possess body; and if it has body, there will be two bodies in the same place at the same time, viz. that which is coming to be and that which was previously there, while if it is incorporeal, there must be an extra-corporeal void. But we have already shown that this is impossible. But, on the other hand, it is equally impossible that the elements should be generated from some kind of body. That would involve a body distinct from the elements and prior to them. But if this body possesses weight or lightness, it will be one of the elements; and if it has no tendency to movement, it will be an immovable or mathematical entity, and therefore not in a place at all. A place in which a thing is at rest is a place in which it might move, either by constraint, i.e. unnaturally, or in the absence of constraint, i.e. naturally. If, then, it is in a place and somewhere, it will be one of the elements; and if it is not in a place, nothing can come from it,

since that which comes into being and that out of which it comes must needs be together. The elements therefore cannot be generated from something incorporeal nor from a body which is not an element, and the only remaining alternative is that they are generated from one another.

7

We must, therefore, turn to the question, what is the manner of their generation from one another? Is it as Empedocles and Democritus say, or as those who resolve bodies into planes say, or is there yet another possibility? (1) What the followers of Empedocles do, though without observing it themselves, is to reduce the generation of elements out of one another to an illusion. They make it a process of excretion from a body of what was in it all the time – as though generation required a vessel rather than a material – so that it involves no change of anything. And even if this were accepted, there are other implications equally unsatisfactory. We do not expect a mass of matter to be made heavier by compression. But they will be bound to maintain this, if they say that water is a body present in air and excreted from air, since air becomes heavier when it turns into water. Again, when the mixed body is divided, they can show no reason why one of the constituents must by itself take up more room than the body did: but when water turns into air, the room occupied is increased. The fact is that the finer body takes up more room, as is obvious in any case of transformation. As the liquid is converted into vapour or air the vessel which contains it is often burst because it does not contain room enough. Now, if there is no void at all, and if, as those who take this view say, there is no expansion of bodies, the impossibility of this is manifest: and if there is void and expansion, there is no accounting for the fact that the body which results from division cfpies of necessity a greater space. It is inevitable, too, that generation of one out of another should come to a stop, since a finite quantum cannot contain an infinity of finite quanta. When earth produces water something is taken away from the earth, for the

process is one of excretion. The same thing happens again when the residue produces water. But this can only go on for ever, if the finite body contains an infinity, which is impossible. Therefore the generation of elements out of one another will not always continue.

(2) We have now explained that the mutual transformations of the elements cannot take place by means of excretion. The remaining alternative is that they should be generated by changing into one another. And this in one of two ways, either by change of shape, as the same wax takes the shape both of a sphere and of a cube, or, as some assert, by resolution into planes. (a) Generation by change of shape would necessarily involve the assertion of atomic bodies. For if the particles were divisible there would be a part of fire which was not fire and a part of earth which was not earth, for the reason that not every part of a pyramid is a pyramid nor of a cube a cube. But if (b) the process is resolution into planes, the first difficulty is that the elements cannot all be generated out of one another. This they are obliged to assert, and do assert. It is absurd, because it is unreasonable that one element alone should have no part in the transformations, and also contrary to the observed data of sense, according to which all alike change into one another. In fact their explanation of the observations is not consistent with the observations. And the reason is that their ultimate principles are wrongly assumed: they had certain predetermined views, and were resolved to bring everything into line with them. It seems that perceptible things require perceptible principles, eternal things eternal principles, corruptible things corruptible principles; and, in general, every subject matter principles homogeneous with itself. But they, owing to their love for their principles, fall into the attitude of men who undertake the defence of a position in argument. In the confidence that the principles are true they are ready to accept any consequence of their application. As though some principles did not require to be judged from their results, and particularly from their final issue! And that issue, which in the case of productive knowledge is the product, in the knowledge of nature is the unimpeachable evidence of the senses as to each fact.

The result of their view is that earth has the best right to the name element, and is alone indestructible; for that which is indissoluble is indestructible and elementary, and earth alone cannot be dissolved into any body but itself. Again, in the case of those elements which do suffer dissolution, the 'suspension' of the triangles is unsatisfactory. But this takes place whenever one is dissolved into another, because of the numerical inequality of the triangles which compose them. Further, those who hold these views must needs suppose that generation does not start from a body. For what is generated out of planes cannot be said to have been generated from a body. And they must also assert that not all bodies are divisible, coming thus into conflict with our most accurate sciences, namely the mathematical, which assume that even the intelligible is divisible, while they, in their anxiety to save their hypothesis, cannot even admit this of every perceptible thing. For any one who gives each element a shape of its own, and makes this the ground of distinction between the substances, has to attribute to them indivisibility; since division of a pyramid or a sphere must leave somewhere at least a residue which is not sphere or a pyramid. Either, then, a part of fire is not fire, so that there is a body prior to the element – for every body is either an element or composed of elements – or not every body is divisible.

8

In general, the attempt to give a shape to each of the simple bodies is unsound, for the reason, first, that they will not succeed in filling the whole. It is agreed that there are only three plane figures which can fill a space, the triangle, the square, and the hexagon, and only two solids, the pyramid and the cube. But the theory needs more than these because the elements which it recognizes are more in number. Secondly, it is manifest that the simple bodies are often given a shape by the place in which they are included, particularly water and air. In such a case the shape of the element cannot persist; for, if it did, the contained mass would not be in continuous contact with the

containing body; while, if its shape is changed, it will cease to be water, since the distinctive quality is shape. Clearly, then, their shapes are not fixed. Indeed, nature itself seems to offer corroboration of this theoretical conclusion. Just as in other cases the substratum must be formless and unshapen – for thus the 'all-receptive', as we read in the Timaeus, will be best for modelling – so the elements should be conceived as a material for composite things; and that is why they can put off their qualitative distinctions and pass into one another. Further, how can they account for the generation of flesh and bone or any other continuous body? The elements alone cannot produce them because their collocation cannot produce a continuum. Nor can the composition of planes; for this produces the elements themselves, not bodies made up of them. Any one then who insists upon an exact statement of this kind of theory, instead of assenting after a passing glance at it, will see that it removes generation from the world.

Further, the very properties, powers, and motions, to which they paid particular attention in allotting shapes, show the shapes not to be in accord with the bodies. Because fire is mobile and productive of heat and combustion, some made it a sphere, others a pyramid. These shapes, they thought, were the most mobile because they offer the fewest points of contact and are the least stable of any; they were also the most apt to produce warmth and combustion, because the one is angular throughout while the other has the most acute angles, and the angles, they say, produce warmth and combustion. Now, in the first place, with regard to movement both are in error. These may be the figures best adapted to movement; they are not, however, well adapted to the movement of fire, which is an upward and rectilinear movement, but rather to that form of circular movement which we call rolling. Earth, again, they call a cube because it is stable and at rest. But it rests only in its own place, not anywhere; from any other it moves if nothing hinders, and fire and the other bodies do the same. The obvious inference, therefore, is that fire and each several element is in a foreign place a sphere or a pyramid, but in its own a cube. Again, if the possession of angles makes a body produce heat and combustion, every element produces heat, though one may do so more than another. For they all possess angles, the octahedron and

dodecahedron as well as the pyramid; and Democritus makes even the sphere a kind of angle, which cuts things because of its mobility. The difference, then, will be one of degree: and this is plainly false. They must also accept the inference that the mathematical produce heat and combustion, since they too possess angles and contain atomic spheres and pyramids, especially if there are, as they allege, atomic figures. Anyhow if these functions belong to some of these things and not to others, they should explain the difference, instead of speaking in quite general terms as they do. Again, combustion of a body produces fire, and fire is a sphere or a pyramid. The body, then, is turned into spheres or pyramids. Let us grant that these figures may reasonably be supposed to cut and break up bodies as fire does; still it remains quite inexplicable that a pyramid must needs produce pyramids or a sphere spheres. One might as well postulate that a knife or a saw divides things into knives or saws. It is also ridiculous to think only of division when allotting fire its shape. Fire is generally thought of as combining and connecting rather than as separating. For though it separates bodies different in kind, it combines those which are the same; and the combining is essential to it, the functions of connecting and uniting being a mark of fire, while the separating is incidental. For the expulsion of the foreign body is an incident in the compacting of the homogeneous. In choosing the shape, then, they should have thought either of both functions or preferably of the combining function. In addition, since hot and cold are contrary powers, it is impossible to allot any shape to the cold. For the shape given must be the contrary of that given to the hot, but there is no contrariety between figures. That is why they have all left the cold out, though properly either all or none should have their distinguishing figures. Some of them, however, do attempt to explain this power, and they contradict themselves. A body of large particles, they say, is cold because instead of penetrating through the passages it crushes. Clearly, then, that which is hot is that which penetrates these passages, or in other words that which has fine particles. It results that hot and cold are distinguished not by the figure but by the size of the particles. Again, if the pyramids are unequal in size, the large ones will not be fire, and that figure will produce not combustion but its contrary.

From what has been said it is clear that the difference of the elements does not depend upon their shape. Now their most important differences are those of property, function, and power; for every natural body has, we maintain, its own functions, properties, and powers. Our first business, then, will be to speak of these, and that inquiry will enable us to explain the differences of each from each.

Book IV

1

We have now to consider the terms 'heavy' and 'light'. We must ask what the bodies so called are, how they are constituted, and what is the reason of their possessing these powers. The consideration of these questions is a proper part of the theory of movement, since we call things heavy and light because they have the power of being moved naturally in a certain way. The activities corresponding to these powers have not been given any name, unless it is thought that 'impetus' is such a name. But because the inquiry into nature is concerned with movement, and these things have in themselves some spark (as it were) of movement, all inquirers avail themselves of these powers, though in all but a few cases without exact discrimination. We must then first look at whatever others have said, and formulate the questions which require settlement in the interests of this inquiry, before we go on to state our own view of the matter.

Language recognizes (a) an absolute, (b) a relative heavy and light. Of two heavy things, such as wood and bronze, we say that the one is

relatively light, the other relatively heavy. Our predecessors have not dealt at all with the absolute use, of the terms, but only with the relative. I mean, they do not explain what the heavy is or what the light is, but only the relative heaviness and lightness of things possessing weight. This can be made clearer as follows. There are things whose constant nature it is to move away from the centre, while others move constantly towards the centre; and of these movements that which is away from the centre I call upward movement and that which is towards it I call downward movement. (The view, urged by some, that there is no up and no down in the heaven, is absurd. There can be, they say, no up and no down, since the universe is similar every way, and from any point on the earth's surface a man by advancing far enough will come to stand foot to foot with himself. But the extremity of the whole, which we call 'above', is in position above and in nature primary. And since the universe has an extremity and a centre, it must clearly have an up and down. Common usage is thus correct, though inadequate. And the reason of its inadequacy is that men think that the universe is not similar every way. They recognize only the hemisphere which is over us. But if they went on to think of the world as formed on this pattern all round, with a centre identically related to each point on the extremity, they would have to admit that the extremity was above and the centre below.) By absolutely light, then, we mean that which moves upward or to the extremity, and by absolutely heavy that which moves downward or to the centre. By lighter or relatively light we mean that one, of two bodies endowed with weight and equal in bulk, which is exceeded by the other in the speed of its natural downward movement.

2

Those of our predecessors who have entered upon this inquiry have for the most part spoken of light and heavy things only in the sense in which one of two things both endowed with weight is said to be the lighter. And this treatment they consider a sufficient analysis also

of the notions of absolute heaviness, to which their account does not apply. This, however, will become clearer as we advance. One use of the terms 'lighter' and 'heavier' is that which is set forth in writing in the Timaeus, that the body which is composed of the greater number of identical parts is relatively heavy, while that which is composed of a smaller number is relatively light. As a larger quantity of lead or of bronze is heavier than a smaller – and this holds good of all homogeneous masses, the superior weight always depending upon a numerical superiority of equal parts – in precisely the same way, they assert, lead is heavier than wood. For all bodies, in spite of the general opinion to the contrary, are composed of identical parts and of a single material. But this analysis says nothing of the absolutely heavy and light. The facts are that fire is always light and moves upward, while earth and all earthy things move downwards or towards the centre. It cannot then be the fewness of the triangles (of which, in their view, all these bodies are composed) which disposes fire to move upward. If it were, the greater the quantity of fire the slower it would move, owing to the increase of weight due to the increased number of triangles. But the palpable fact, on the contrary, is that the greater the quantity, the lighter the mass is and the quicker its upward movement: and, similarly, in the reverse movement from above downward, the small mass will move quicker and the large slower. Further, since to be lighter is to have fewer of these homogeneous parts and to be heavier is to have more, and air, water, and fire are composed of the same triangles, the only difference being in the number of such parts, which must therefore explain any distinction of relatively light and heavy between these bodies, it follows that there must be a certain quantum of air which is heavier than water. But the facts are directly opposed to this. The larger the quantity of air the more readily it moves upward, and any portion of air without exception will rise up out of the water.

So much for one view of the distinction between light and heavy. To others the analysis seems insufficient; and their views on the subject, though they belong to an older generation than ours, have an air of novelty. It is apparent that there are bodies which, when smaller in bulk than others, yet exceed them in weight. It is therefore obviously insufficient to say that bodies of equal weight are composed of an

equal number of primary parts: for that would give equality of bulk. Those who maintain that the primary or atomic parts, of which bodies endowed with weight are composed, are planes, cannot so speak without absurdity; but those who regard them as solids are in a better position to assert that of such bodies the larger is the heavier. But since in composite bodies the weight obviously does not correspond in this way to the bulk, the lesser bulk being often superior in weight (as, for instance, if one be wool and the other bronze), there are some who think and say that the cause is to be found elsewhere. The void, they say, which is imprisoned in bodies, lightens them and sometimes makes the larger body the lighter. The reason is that there is more void. And this would also account for the fact that a body composed of a number of solid parts equal to, or even smaller than, that of another is sometimes larger in bulk than it. In short, generally and in every case a body is relatively light when it contains a relatively large amount of void. This is the way they put it themselves, but their account requires an addition. Relative lightness must depend not only on an excess of void, but also an a defect of solid: for if the ratio of solid to void exceeds a certain proportion, the relative lightness will disappear. Thus fire, they say, is the lightest of things just for this reason that it has the most void. But it would follow that a large mass of gold, as containing more void than a small mass of fire, is lighter than it, unless it also contains many times as much solid. The addition is therefore necessary.

Of those who deny the existence of a void some, like Anaxagoras and Empedocles, have not tried to analyse the notions of light and heavy at all; and those who, while still denying the existence of a void, have attempted this, have failed to explain why there are bodies which are absolutely heavy and light, or in other words why some move upward and others downward. The fact, again, that the body of greater bulk is sometimes lighter than smaller bodies is one which they have passed over in silence, and what they have said gives no obvious suggestion for reconciling their views with the observed facts.

But those who attribute the lightness of fire to its containing so much void are necessarily involved in practically the same difficulties. For though fire be supposed to contain less solid than any other body, as

well as more void, yet there will be a certain quantum of fire in which the amount of solid or plenum is in excess of the solids contained in some small quantity of earth. They may reply that there is an excess of void also. But the question is, how will they discriminate the absolutely heavy? Presumably, either by its excess of solid or by its defect of void. On the former view there could be an amount of earth so small as to contain less solid than a large mass of fire. And similarly, if the distinction rests on the amount of void, there will be a body, lighter than the absolutely light, which nevertheless moves downward as constantly as the other moves upward. But that cannot be so, since the absolutely light is always lighter than bodies which have weight and move downward, while, on the other hand, that which is lighter need not be light, because in common speech we distinguish a lighter and a heavier (viz. water and earth) among bodies endowed with weight. Again, the suggestion of a certain ratio between the void and the solid in a body is no more equal to solving the problem before us. The manner of speaking will issue in a similar impossibility. For any two portions of fire, small or great, will exhibit the same ratio of solid to void, but the upward movement of the greater is quicker than that of the less, just as the downward movement of a mass of gold or lead, or of any other body endowed with weight, is quicker in proportion to its size. This, however, should not be the case if the ratio is the ground of distinction between heavy things and light. There is also an absurdity in attributing the upward movement of bodies to a void which does not itself move. If, however, it is the nature of a void to move upward and of a plenum to move downward, and therefore each causes a like movement in other things, there was no need to raise the question why composite bodies are some light and some heavy; they had only to explain why these two things are themselves light and heavy respectively, and to give, further, the reason why the plenum and the void are not eternally separated. It is also unreasonable to imagine a place for the void, as if the void were not itself a kind of place. But if the void is to move, it must have a place out of which and into which the change carries it. Also what is the cause of its movement? Not, surely, its voidness: for it is not the void only which is moved, but also the solid.

Similar difficulties are involved in all other methods of distinction, whether they account for the relative lightness and heaviness of bodies by distinctions of size, or proceed on any other principle, so long as they attribute to each the same matter, or even if they recognize more than one matter, so long as that means only a pair of contraries. If there is a single matter, as with those who compose things of triangles, nothing can be absolutely heavy or light: and if there is one matter and its contrary – the void, for instance, and the plenum – no reason can be given for the relative lightness and heaviness of the bodies intermediate between the absolutely light and heavy when compared either with one another or with these themselves. The view which bases the distinction upon differences of size is more like a mere fiction than those previously mentioned, but, in that it is able to make distinctions between the four elements, it is in a stronger position for meeting the foregoing difficulties. Since, however, it imagines that these bodies which differ in size are all made of one substance, it implies, equally with the view that there is but one matter, that there is nothing absolutely light and nothing which moves upward (except as being passed by other things or forced up by them); and since a multitude of small atoms are heavier than a few large ones, it will follow that much air or fire is heavier than a little water or earth, which is impossible.

3

These, then, are the views which have been advanced by others and the terms in which they state them. We may begin our own statement by settling a question which to some has been the main difficulty – the question why some bodies move always and naturally upward and others downward, while others again move both upward and downward. After that we will inquire into light and heavy and of the various phenomena connected with them. The local movement of each body into its own place must be regarded as similar to what happens in connexion with other forms of generation and change. There are, in fact, three kinds of movement, affecting respectively the

size, the form, and the place of a thing, and in each it is observable that change proceeds from a contrary to a contrary or to something intermediate: it is never the change of any chance subject in any chance direction, nor, similarly, is the relation of the mover to its object fortuitous: the thing altered is different from the thing increased, and precisely the same difference holds between that which produces alteration and that which produces increase. In the same manner it must be thought that produces local motion and that which is so moved are not fortuitously related. Now, that which produces upward and downward movement is that which produces weight and lightness, and that which is moved is that which is potentially heavy or light, and the movement of each body to its own place is motion towards its own form. (It is best to interpret in this sense the common statement of the older writers that 'like moves to like'. For the words are not in every sense true to fact. If one were to remove the earth to where the moon now is, the various fragments of earth would each move not towards it but to the place in which it now is. In general, when a number of similar and undifferentiated bodies are moved with the same motion this result is necessarily produced, viz. that the place which is the natural goal of the movement of each single part is also that of the whole. But since the place of a thing is the boundary of that which contains it, and the continent of all things that move upward or downward is the extremity and the centre, and this boundary comes to be, in a sense, the form of that which is contained, it is to its like that a body moves when it moves to its own place. For the successive members of the scries are like one another: water, I mean, is like air and air like fire, and between intermediates the relation may be converted, though not between them and the extremes; thus air is like water, but water is like earth: for the relation of each outer body to that which is next within it is that of form to matter.) Thus to ask why fire moves upward and earth downward is the same as to ask why the healable, when moved and changed qua healable, attains health and not whiteness; and similar questions might be asked concerning any other subject of aletion. Of course the subject of increase, when changed qua increasable, attains not health but a superior size. The same applies in the other cases. One thing changes in quality,

another in quantity: and so in place, a light thing goes upward, a heavy thing downward. The only difference is that in the last case, viz. that of the heavy and the light, the bodies are thought to have a spring of change within themselves, while the subjects of healing and increase are thought to be moved purely from without. Sometimes, however, even they change of themselves, ie. in response to a slight external movement reach health or increase, as the case may be. And since the same thing which is healable is also receptive of disease, it depends on whether it is moved qua healable or qua liable to disease whether the motion is towards health or towards disease. But the reason why the heavy and the light appear more than these things to contain within themselves the source of their movements is that their matter is nearest to being. This is indicated by the fact that locomotion belongs to bodies only when isolated from other bodies, and is generated last of the several kinds of movement; in order of being then it will be first. Now whenever air comes into being out of water, light out of heavy, it goes to the upper place. It is forthwith light: becoming is at an end, and in that place it has being. Obviously, then, it is a potentiality, which, in its passage to actuality, comes into that place and quantity and quality which belong to its actuality. And the same fact explains why what is already actually fire or earth moves, when nothing obstructs it, towards its own place. For motion is equally immediate in the case of nutriment, when nothing hinders, and in the case of the thing healed, when nothing stays the healing. But the movement is also due to the original creative force and to that which removes the hindrance or off which the moving thing rebounded, as was explained in our opening discussions, where we tried to show how none of these things moves itself. The reason of the various motions of the various bodies, and the meaning of the motion of a body to its own place, have now been explained.

4

We have now to speak of the distinctive properties of these bodies and of the various phenomena connected with them. In accordance with general conviction we may distinguish the absolutely heavy, as that which sinks to the bottom of all things, from the absolutely light, which is that which rises to the surface of all things. I use the term 'absolutely', in view of the generic character of 'light' and 'heavy', in order to confine the application to bodies which do not combine lightness and heaviness. It is apparent, I mean, that fire, in whatever quantity, so long as there is no external obstacle moves upward, and earth downward; and, if the quantity is increased, the movement is the same, though swifter. But the heaviness and lightness of bodies which combine these qualities is different from this, since while they rise to the surface of some bodies they sink to the bottom of others. Such are air and water. Neither of them is absolutely either light or heavy. Both are lighter than earth – for any portion of either rises to the surface of it – but heavier than fire, since a portion of either, whatever its quantity, sinks to the bottom of fire; compared together, however, the one has absolute weight, the other absolute lightness, since air in any quantity rises to the surface of water, while water in any quantity sinks to the bottom of air. Now other bodies are severally light and heavy, and evidently in them the attributes are due to the difference of their uncompounded parts: that is to say, according as the one or the other happens to preponderate the bodies will be heavy and light respectively. Therefore we need only speak of these parts, since they are primary and all else consequential: and in so doing we shall be following the advice which we gave to those whose attribute heaviness to the presence of plenum and lightness to that of void. It is due to the properties of the elementary bodies that a body which is regarded as light in one place is regarded as heavy in another, and vice versa. In air, for instance, a talent's weight of wood is heavier than a mina of lead, but in water the wood is the lighter. The reason is that all the elements except fire have weight and all but earth lightness. Earth, then, and bodies in which earth preponderates, must needs have weight everywhere, while water is heavy anywhere but in earth, and air is heavy when not in water or earth. In its own place each of these bodies has weight except fire,

even air. Of this we have evidence in the fact that a bladder when inflated weighs more than when empty. A body, then, in which air preponderates over earth and water, may well be lighter than something in water and yet heavier than it in air, since such a body does not rise in air but rises to the surface in water.

The following account will make it plain that there is an absolutely light and an absolutely heavy body. And by absolutely light I mean one which of its own nature always moves upward, by absolutely heavy one which of its own nature always moves downward, if no obstacle is in the way. There are, I say, these two kinds of body, and it is not the case, as some maintain, that all bodies have weight. Different views are in fact agreed that there is a heavy body, which moves uniformly towards the centre. But is also similarly a light body. For we see with our eyes, as we said before, that earthy things sink to the bottom of all things and move towards the centre. But the centre is a fixed point. If therefore there is some body which rises to the surface of all things – and we observe fire to move upward even in air itself, while the air remains at rest – clearly this body is moving towards the extremity. It cannot then have any weight. If it had, there would be another body in which it sank: and if that had weight, there would be yet another which moved to the extremity and thus rose to the surface of all moving things. In fact, however, we have no evidence of such a body. Fire, then, has no weight. Neither has earth any lightness, since it sinks to the bottom of all things, and that which sinks moves to the centre. That there is a centre towards which the motion of heavy things, and away from which that of light things is directed, is manifest in many ways. First, because no movement can continue to infinity. For what cannot be can no more come-to-be than be, and movement is a coming-to-be in one place from another. Secondly, like the upward movement of fire, the downward movement of earth and all heavy things makes equal angles on every side with the earth's surface: it must therefore be directed towards the centre. Whether it is really the centre of the earth and not rather that of the whole to which it moves, may be left to another inquiry, since these are coincident. But since that which sinks to the bottom of all things moves to the centre, necessarily that which rises to the surface moves to the extremity of the region in

which the movement of these bodies takes place. For the centre is opposed as contrary to the extremity, as that which sinks is opposed to that which rises to the surface. This also gives a reasonable ground for the duality of heavy and light in the spatial duality centre and extremity. Now there is also the intermediate region to which each name is given in opposition to the other extreme. For that which is intermediate between the two is in a sense both extremity and centre. For this reason there is another heavy and light; namely, water and air. But in our view the continent pertains to form and the contained to matter: and this distinction is present in every genus. Alike in the sphere of quality and in that of quantity there is that which corresponds rather to form and that which corresponds to matter. In the same way, among spatial distinctions, the above belongs to the determinate, the below to matter. The same holds, consequently, also of the matter itself of that which is heavy and light: as potentially possessing the one character, it is matter for the heavy, and as potentially possessing the other, for the light. It is the same matter, but its being is different, as that which is receptive of disease is the same as that which is receptive of health, though in being different from it, and therefore diseasedness is different from healthiness.

5

A thing then which has the one kind of matter is light and always moves upward, while a thing which has the opposite matter is heavy and always moves downward. Bodies composed of kinds of matter different from these but having relatively to each other the character which these have absolutely, possess both the upward and the downward motion. Hence air and water each have both lightness and weight, and water sinks to the bottom of all things except earth, while air rises to the surface of all things except fire. But since there is one body only which rises to the surface of all things and one only which sinks to the bottom of all things, there must needs be two other bodies which sink in some bodies and rise to the surface of

others. The kinds of matter, then, must be as numerous as these bodies, i.e. four, but though they are four there must be a common matter of all – particularly if they pass into one another – which in each is in being different. There is no reason why there should not be one or more intermediates between the contraries, as in the case of colour; for 'intermediate' and 'mean' are capable of more than one application.

Now in its own place every body endowed with both weight and lightness has weight – whereas earth has weight everywhere – but they only have lightness among bodies to whose surface they rise. Hence when a support is withdrawn such a body moves downward until it reaches the body next below it, air to the place of water and water to that of earth. But if the fire above air is removed, it will not move upward to the place of fire, except by constraint; and in that way water also may be drawn up, when the upward movement of air which has had a common surface with it is swift enough to overpower the downward impulse of the water. Nor does water move upward to the place of air, except in the manner just described. Earth is not so affected at all, because a common surface is not possible to it. Hence water is drawn up into the vessel to which fire is applied, but not earth. As earth fails to move upward, so fire fails to move downward when air is withdrawn from beneath it: for fire has no weight even in its own place, as earth has no lightness. The other two move downward when the body beneath is withdrawn because, while the absolutely heavy is that which sinks to the bottom of all things, the relatively heavy sinks to its own place or to the surface of the body in which it rises, since it is similar in matter to it.

It is plain that one must suppose as many distinct species of matter as there are bodies. For if, first, there is a single matter of all things, as, for instance, the void or the plenum or extension or the triangles, either all things will move upward or all things will move downward, and the second motion will be abolished. And so, either there will be no absolutely light body, if superiority of weight is due to superior size or number of the constituent bodies or to the fullness of the body: but the contrary is a matter of observation, and it has been shown that the downward and upward movements are equally

constant and universal: or, if the matter in question is the void or something similar, which moves uniformly upward, there will be nothing to move uniformly downward. Further, it will follow that the intermediate bodies move downward in some cases quicker than earth: for air in sufficiently large quantity will contain a larger number of triangles or solids or particles. It is, however, manifest that no portion of air whatever moves downward. And the same reasoning applies to lightness, if that is supposed to depend on superiority of quantity of matter. But if, secondly, the kinds of matter are two, it will be difficult to make the intermediate bodies behave as air and water behave. Suppose, for example, that the two asserted are void and plenum. Fire, then, as moving upward, will be void, earth, as moving downward, plenum; and in air, it will be said, fire preponderates, in water, earth. There will then be a quantity of water containing more fire than a little air, and a large amount of air will contain more earth than a little water: consequently we shall have to say that air in a certain quantity moves downward more quickly than a little water. But such a thing has never been observed anywhere. Necessarily, then, as fire goes up because it has something, e.g. void, which other things do not have, and earth goes downward because it has plenum, so air goes to its own place above water because it has something else, and water goes downward because of some special kind of body. But if the two bodies are one matter, or two matters both present in each, there will be a certain quantity of each at which water will excel a little air in the upward movement and air excel water in the downward movement, as we have already often said.

6

The shape of bodies will not account for their moving upward or downward in general, though it will account for their moving faster or slower. The reasons for this are not difficult to see. For the problem thus raised is why a flat piece of iron or lead floats upon water, while smaller and less heavy things, so long as they are round or long – a needle, for instance – sink down; and sometimes a thing floats

because it is small, as with gold dust and the various earthy and dusty materials which throng the air. With regard to these questions, it is wrong to accept the explanation offered by Democritus. He says that the warm bodies moving up out of the water hold up heavy bodies which are broad, while the narrow ones fall through, because the bodies which offer this resistance are not numerous. But this would be even more likely to happen in air – an objection which he himself raises. His reply to the objection is feeble. In the air, he says, the 'drive' (meaning by drive the movement of the upward moving bodies) is not uniform in direction. But since some continua are easily divided and others less easily, and things which produce division differ similarly in the case with which they produce it, the explanation must be found in this fact. It is the easily bounded, in proportion as it is easily bounded, which is easily divided; and air is more so than water, water than earth. Further, the smaller the quantity in each kind, the more easily it is divided and disrupted. Thus the reason why broad things keep their place is because they cover so wide a surface and the greater quantity is less easily disrupted. Bodies of the opposite shape sink down because they occupy so little of the surface, which is therefore easily parted. And these considerations apply with far greater force to air, since it is so much more easily divided than water. But since there are two factors, the force responsible for the downward motion of the heavy body and the disruption-resisting force of the continuous surface, there must be some ratio between the two. For in proportion as the force applied by the heavy thing towards disruption and division exceeds that which resides in the continuum, the quicker will it force its way down; only if the force of the heavy thing is the weaker, will it ride upon the surface.

We have now finished our examination of the heavy and the light and of the phenomena connected with them.

Aristotle - On Generation and Corruption

[Translated by H. H. Joachim]

Book I

1

Our next task is to study coming-to-be and passing-away. We are to distinguish the causes, and to state the definitions, of these processes considered in general – as changes predicable uniformly of all the things that come-to-be and pass-away by nature. Further, we are to study growth and 'alteration'. We must inquire what each of them is; and whether 'alteration' is to be identified with coming-to-be, or whether to these different names there correspond two separate processes with distinct natures.

On this question, indeed, the early philosophers are divided. Some of them assert that the so-called 'unqualified coming-to-be' is 'alteration', while others maintain that 'alteration' and coming-to-be are distinct. For those who say that the universe is one something (i.e. those who generate all things out of one thing) are bound to assert that coming-to-be is 'alteration', and that whatever 'comes-to-be' in the proper sense of the term is 'being altered': but those who make the matter of things more than one must distinguish coming-to-be from 'alteration'. To this latter class belong Empedocles, Anaxagoras, and Leucippus. And yet Anaxagoras himself failed to understand his own utterance. He says, at all events, that coming-to-be and passing-

away are the same as ‘being altered’:’ yet, in common with other thinkers, he affirms that the elements are many. Thus Empedocles holds that the corporeal elements are four, while all the elements – including those which initiate movement – are six in number; whereas Anaxagoras agrees with Leucippus and Democritus that the elements are infinite.

(Anaxagoras posits as elements the ‘homoeomeries’, viz. bone, flesh, marrow, and everything else which is such that part and whole are the same in name and nature; while Democritus and Leucippus say that there are indivisible bodies, infinite both in number and in the varieties of their shapes, of which everything else is composed – the compounds differing one from another according to the shapes, ‘positions’, and ‘groupings’ of their constituents.)

For the views of the school of Anaxagoras seem diametrically opposed to those of the followers of Empedocles. Empedocles says that Fire, Water, Air, and Earth are four elements, and are thus ‘simple’ rather than flesh, bone, and bodies which, like these, are ‘homoeomeries’. But the followers of Anaxagoras regard the ‘homoeomeries’ as ‘simple’ and elements, whilst they affirm that Earth, Fire, Water, and Air are composite; for each of these is (according to them) a ‘common seminary’ of all the ‘homoeomeries’.

Those, then, who construct all things out of a single element, must maintain that coming-to-be and passing-away are ‘alteration’. For they must affirm that the underlying something always remains identical and one; and change of such a substratum is what we call ‘altering’ Those, on the other hand, who make the ultimate kinds of things more than one, must maintain that ‘alteration’ is distinct from coming-to-be: for coming-to-be and passing-away result from the consilience and the dissolution of the many kinds. That is why Empedocles too

uses language to this effect, when he says 'There is no coming-to-be of anything, but only a mingling and a divorce of what has been mingled'. Thus it is clear (i) that to describe coming-to-be and passing-away in these terms is in accordance with their fundamental assumption, and (ii) that they do in fact so describe them: nevertheless, they too must recognize 'alteration' as a fact distinct from coming-to-be, though it is impossible for them to do so consistently with what they say.

That we are right in this criticism is easy to perceive. For 'alteration' is a fact of observation. While the substance of the thing remains unchanged, we see it 'altering' just as we see in it the changes of magnitude called 'growth' and 'diminution'. Nevertheless, the statements of those who posit more 'original reals' than one make 'alteration' impossible. For 'alteration, as we assert, takes place in respect to certain qualities: and these qualities (I mean, e.g. hot-cold, white-black, dry-moist, soft-hard, and so forth) are, all of them, differences characterizing the 'elements'. The actual words of Empedocles may be quoted in illustration :

The sun everywhere bright to see, and hot,

The rain everywhere dark and cold;

and he distinctively characterizes his remaining elements in a similar manner. Since, therefore, it is not possible for Fire to become Water, or Water to become Earth, neither will it be possible for anything white to become black, or anything soft to become hard; and the same argument applies to all the other qualities. Yet this is what 'alteration' essentially is.

It follows, as an obvious corollary, that a single matter must always be assumed as underlying the contrary 'poles' of any change whether change of place, or growth and diminution, or 'alteration'; further, that the being of this matter and the being

of 'alteration' stand and fall together. For if the change is 'alteration', then the substratum is a single element; i.e. all things which admit of change into one another have a single matter. And, conversely, if the substratum of the changing things is one, there is 'alteration'.

Empedocles, indeed, seems to contradict his own statements as well as the observed facts. For he denies that any one of his elements comes-to-be out of any other, insisting on the contrary that they are the things out of which everything else comes-to-be; and yet (having brought the entirety of existing things, except Strife, together into one) he maintains, simultaneously with this denial, that each thing once more comes-to-be out of the One. Hence it was clearly out of a One that this came-to-be Water, and that Fire, various portions of it being separated off by certain characteristic differences or qualities – as indeed he calls the sun 'white and hot', and the earth 'heavy and hard'. If, therefore, these characteristic differences be taken away (for they can be taken away, since they came-to-be), it will clearly be inevitable for Earth to come-to-be out of Water and Water out of Earth, and for each of the other elements to undergo a similar transformation – not only then, but also now – if, and because, they change their qualities. And, to judge by what he says, the qualities are such that they can be 'attached' to things and can again be 'separated' from them, especially since Strife and Love are still fighting with one another for the mastery. It was owing to this same conflict that the elements were generated from a One at the former period. I say 'generated', for presumably Fire, Earth, and Water had no distinctive existence at all while merged in one.

There is another obscurity in the theory Empedocles. Are we to regard the One as his 'original real'? Or is it the Many – i.e. Fire and Earth, and the bodies co-ordinate with these? For the One is an 'element' in so far as it underlies the process as matter – as

that out of which Earth and Fire come-to-be through a change of qualities due to 'the motion'. On the other hand, in so far as the One results from composition (by a consilience of the Many), whereas they result from disintegration the Many are more 'elementary' than the One, and prior to it in their nature.

2

We have therefore to discuss the whole subject of 'unqualified' coming-to-be and passing-away; we have to inquire whether these changes do or do not occur and, if they occur, to explain the precise conditions of their occurrence. We must also discuss the remaining forms of change, viz. growth and 'alteration'. For though, no doubt, Plato investigated the conditions under which things come-to-be and pass-away, he confined his inquiry to these changes; and he discussed not all coming-to-be, but only that of the elements. He asked no questions as to how flesh or bones, or any of the other similar compound things, come-to-be; nor again did he examine the conditions under which 'alteration' or growth are attributable to things.

A similar criticism applies to all our predecessors with the single exception of Democritus. Not one of them penetrated below the surface or made a thorough examination of a single one of the problems. Democritus, however, does seem not only to have thought carefully about all the problems, but also to be distinguished from the outset by his method. For, as we are saying, none of the other philosophers made any definite statement about growth, except such as any amateur might have made. They said that things grow 'by the accession of like to like', but they did not proceed to explain the manner of this accession. Nor did they give any account of 'combination': and

they neglected almost every single one of the remaining problems, offering no explanation, e.g. of 'action' or 'passion' how in physical actions one thing acts and the other undergoes action. Democritus and Leucippus, however, postulate the 'figures', and make 'alteration' and coming-to-be result from them. They explain coming-to-be and passing-away by their 'dissociation' and 'association', but 'alteration' by their 'grouping' and 'Position'. And since they thought that the 'truth lay in the appearance, and the appearances are conflicting and infinitely many, they made the 'figures' infinite in number. Hence – owing to the changes of the compound – the same thing seems different and conflicting to different people: it is 'transposed' by a small additional ingredient, and appears utterly other by the 'transposition' of a single constituent. For Tragedy and Comedy are both composed of the same letters.

Since almost all our predecessors think (i) that coming-to-be is distinct from 'alteration', and (ii) that, whereas things 'alter' by change of their qualities, it is by 'association' and 'dissociation' that they come-to-be and pass-away, we must concentrate our attention on these theses. For they lead to many perplexing and well-grounded dilemmas. If, on the one hand, coming-to-be is 'association', many impossible consequences result: and yet there are other arguments, not easy to unravel, which force the conclusion upon us that coming-to-be cannot possibly be anything else. If, on the other hand, coming-to-be is not 'association', either there is no such thing as coming-to-be at all or it is 'alteration': or else we must endeavour to unravel this dilemma too – and a stubborn one we shall find it. The fundamental question, in dealing with all these difficulties, is this: 'Do things come-to-be and «alter» and grow, and undergo the contrary changes, because the primary «reals» are indivisible magnitudes? Or is no magnitude indivisible?' For the answer we give to this question makes the greatest difference. And again, if the primary 'reals' are indivisible magnitudes, are

these bodies, as Democritus and Leucippus maintain? Or are they planes, as is asserted in the Timaeus?

To resolve bodies into planes and no further – this, as we have also remarked elsewhere, in itself a paradox. Hence there is more to be said for the view that there are indivisible bodies. Yet even these involve much of paradox. Still, as we have said, it is possible to construct 'alteration' and coming-to-be with them, if one 'transposes' the same by 'turning' and 'intercontact', and by 'the varieties of the figures', as Democritus does. (His denial of the reality of colour is a corollary from this position: for, according to him, things get coloured by 'turning' of the 'figures'.) But the possibility of such a construction no longer exists for those who divide bodies into planes. For nothing except solids results from putting planes together: they do not even attempt to generate any quality from them.

Lack of experience diminishes our power of taking a comprehensive view of the admitted facts. Hence those who dwell in intimate association with nature and its phenomena grow more and more able to formulate, as the foundations of their theories, principles such as to admit of a wide and coherent development: while those whom devotion to abstract discussions has rendered unobservant of the facts are too ready to dogmatize on the basis of a few observations. The rival treatments of the subject now before us will serve to illustrate how great is the difference between a 'scientific' and a 'dialectical' method of inquiry. For, whereas the Platonists argue that there must be atomic magnitudes 'because otherwise «The Triangle» will be more than one', Democritus would appear to have been convinced by arguments appropriate to the subject, i.e. drawn from the science of nature. Our meaning will become clear as we proceed. For to suppose that a body (i.e. a magnitude) is divisible through and through, and that this

division is possible, involves a difficulty. What will there be in the body which escapes the division?

If it is divisible through and through, and if this division is possible, then it might be, at one and the same moment, divided through and through, even though the dividings had not been effected simultaneously: and the actual occurrence of this result would involve no impossibility. Hence the same principle will apply whenever a body is by nature divisible through and through, whether by bisection, or generally by any method whatever: nothing impossible will have resulted if it has actually been divided – not even if it has been divided into innumerable parts, themselves divided innumerable times. Nothing impossible will have resulted, though perhaps nobody in fact could so divide it.

Since, therefore, the be dy is divisible through and through, let it have been divided. What, then, will remain? A magnitude? No: that is impossible, since then there will be something not divided, whereas ex hypothesis the body was divisible through and through. But if it be admitted that neither a body nor a magnitude will remain, and yet division is to take place, the constituents of the body will either be points (i.e. without magnitude) or absolutely nothing. If its constituents are nothings, then it might both come-to-be out of nothings and exist as a composite of nothings: and thus presumably the whole body will be nothing but an appearance. But if it consists of points, a similar absurdity will result: it will not possess any magnitude. For when the points were in contact and coincided to form a single magnitude, they did not make the whole any bigger (since, when the body was divided into two or more parts, the whole was not a bit smaller or bigger than it was before the division): hence, even if all the points be put together, they will not make any magnitude.

But suppose that, as the body is being divided, a minute section – a piece of sawdust, as it were – is extracted, and that in this sense – a body 'comes away' from the magnitude, evading the division. Even then the same argument applies. For in what sense is that section divisible? But if what 'came away' was not a body but a separable form or quality, and if the magnitude is 'points or contacts thus qualified': it is paradoxical that a magnitude should consist of elements, which are not magnitudes. Moreover, where will the points be? And are they motionless or moving? And every contact is always a contact of two somethings, i.e. there is always something besides the contact or the division or the point.

These, then, are the difficulties resulting from the supposition that any and every body, whatever its size, is divisible through and through. There is, besides, this further consideration. If, having divided a piece of wood or anything else, I put it together, it is again equal to what it was, and is one. Clearly this is so, whatever the point at which I cut the wood. The wood, therefore, has been divided potentially through and through. What, then, is there in the wood besides the division? For even if we suppose there is some quality, yet how is the wood dissolved into such constituents and how does it come-to-be out of them? Or how are such constituents separated so as to exist apart from one another? Since, therefore, it is impossible for magnitudes to consist of contacts or points, there must be indivisible bodies and magnitudes. Yet, if we do postulate the latter, we are confronted with equally impossible consequences, which we have examined in other works.' But we must try to disentangle these perplexities, and must therefore formulate the whole problem over again.

On the one hand, then, it is in no way paradoxical that every perceptible body should be indivisible as well as divisible at any and every point. For the second predicate will at. tach to it

potentially, but the first actually. On the other hand, it would seem to be impossible for a body to be, even potentially, divisible at all points simultaneously. For if it were possible, then it might actually occur, with the result, not that the body would simultaneously be actually both (indivisible and divided), but that it would be simultaneously divided at any and every point. Consequently, nothing will remain and the body will have passed-away into what is incorporeal: and so it might come-to-be again either out of points or absolutely out of nothing. And how is that possible?

But now it is obvious that a body is in fact divided into separable magnitudes which are smaller at each division – into magnitudes which fall apart from one another and are actually separated. Hence (it is urged) the process of dividing a body part by part is not a 'breaking up' which could continue ad infinitum; nor can a body be simultaneously divided at every point, for that is not possible; but there is a limit, beyond which the 'breaking up' cannot proceed. The necessary consequence – especially if coming-to-be and passing-away are to take place by 'association' and 'dissociation' respectively – is that a body must contain atomic magnitudes which are invisible. Such is the argument which is believed to establish the necessity of atomic magnitudes: we must now show that it conceals a faulty inference, and exactly where it conceals it.

For, since point is not 'immediately-next' to point, magnitudes are 'divisible through and through' in one sense, and yet not in another. When, however, it is admitted that a magnitude is 'divisible through and through', it is thought there is a point not only anywhere, but also everywhere, in it: hence it is supposed to follow, from the admission, that the magnitude must be divided away into nothing. For it is supposed – there is a point everywhere within it, so that it consists either of contacts or of points. But it is only in one sense that the magnitude is

‘divisible through and through’, viz. in so far as there is one point anywhere within it and all its points are everywhere within it if you take them singly one by one. But there are not more points than one anywhere within it, for the points are not ‘consecutive’: hence it is not simultaneously ‘divisible through and through’. For if it were, then, if it be divisible at its centre, it will be divisible also at a point ‘immediately-next’ to its centre. But it is not so divisible: for position is not ‘immediately-next’ to position, nor point to point – in other words, division is not ‘immediately-next’ to division, nor composition to composition.

Hence there are both ‘association’ and ‘dissociation’, though neither (a) into, and out of, atomic magnitudes (for that involves many impossibilities), nor (b) so that division takes place through and through – for this would have resulted only if point had been ‘immediately-next’ to point: but ‘dissociation’ takes place into small (i.e. relatively small) parts, and ‘association’ takes place out of relatively small parts.

It is wrong, however, to suppose, as some assert, that coming-to-be and passing-away in the unqualified and complete sense are distinctively defined by ‘association’ and ‘dissociation’, while the change that takes place in what is continuous is ‘alteration’. On the contrary, this is where the whole error lies. For unqualified coming-to-be and passing-away are not effected by ‘association’ and ‘dissociation’. They take place when a thing changes, from this to that, as a whole. But the philosophers we are criticizing suppose that all such change is ‘alteration’: whereas in fact there is a difference. For in that which underlies the change there is a factor corresponding to the definition and there is a material factor. When, then, the change is in these constitutive factors, there will be coming-to-be or passing-away: but when it is in the thing’s qualities, i.e. a change of the thing per accidents, there will be ‘alteration’.

‘Dissociation’ and ‘association’ affect the thing’s susceptibility to passing-away. For if water has first been ‘dissociated’ into smallish drops, air comes-to-be out of it more quickly: while, if drops of water have first been ‘associated’, air comes-to-be more slowly. Our doctrine will become clearer in the sequel.’ Meantime, so much may be taken as established – viz. that coming-to-be cannot be ‘association’, at least not the kind of ‘association’ some philosophers assert it to be.

3

Now that we have established the preceding distinctions, we must first consider whether there is anything which comes-to-be and passes-away in the unqualified sense: or whether nothing comes-to-be in this strict sense, but everything always comes-to-be something and out of something – I mean, e.g. comes-to-be-healthy out of being-ill and ill out of being-healthy, comes-to-be-small out of being-big and big out of being-small, and so on in every other instance. For if there is to be coming-to-be without qualification, ‘something’ must – without qualification – ‘come-to-be out of not-being’, so that it would be true to say that ‘not-being is an attribute of some things’. For qualified coming-to-be is a process out of qualified not-being (e.g. out of not-white or not-beautiful), but unqualified coming-to-be is a process out of unqualified not-being.

Now ‘unqulified’ means either (i) the primary predication within each Category, or (ii) the universal, i.e. the all-comprehensive, predication. Hence, if ‘unqualified not-being’ means the negation of ‘being’ in the sense of the primary term of the Category in question, we shall have, in ‘unqualified coming-to-be’, a coming-to-be of a substance out of not-substance. But

that which is not a substance or a ‘this’ clearly cannot possess predicates drawn from any of the other Categories either – e.g. we cannot attribute to it any quality, quantity, or position. Otherwise, properties would admit of existence in separation from substances. If, on the other hand, ‘unqualified not-being’ means ‘what is not in any sense at all’, it will be a universal negation of all forms of being, so that what comes-to-be will have to come-to-be out of nothing.

Although we have dealt with these problems at greater length in another work,where we have set forth the difficulties and established the distinguishing definitions, the following concise restatement of our results must here be offered: In one sense things come-to-be out of that which has no ‘being’ without qualification: yet in another sense they come-to-be always out of what is’. For coming-to-be necessarily implies the pre-existence of something which potentially ‘is’, but actually ‘is not’; and this something is spoken of both as ‘being’ and as ‘not-being’.

These distinctions may be taken as established: but even then it is extraordinarily difficult to see how there can be ‘unqualified coming-to-be’ (whether we suppose it to occur out of what potentially ‘is’, or in some other way), and we must recall this problem for further examination. For the question might be raised whether substance (i.e. the ‘this’) comes-to-be at all. Is it not rather the ‘such’, the ‘so great’, or the ‘somewhere’, which comes-to-be? And the same question might be raised about ‘passing-away’ also. For if a substantial thing comes-to-be, it is clear that there will ‘be’ (not actually, but potentially) a substance, out of which its coming-to-be will proceed and into which the thing that is passing-away will necessarily change. Then will any predicate belonging to the remaining Categories attach actually to this presupposed substance? In other words, will that which is only potentially a ‘this’ (which only

potentially is), while without the qualification 'potentially' it is not a 'this' (i.e. is not), possess, e.g. any determinate size or quality or position? For (i) if it possesses none of these determinations actually, but all of them only potentially, the result is first that a being, which is not a determinate being, is capable of separate existence; and in addition that coming-to-be proceeds out of nothing pre-existing – a thesis which, more than any other, preoccupied and alarmed the earliest philosophers. On the other hand (ii) if, although it is not a 'this somewhat' or a substance, it is to possess some of the remaining determinations quoted above, then (as we said)' properties will be separable from substances.

We must therefore concentrate all our powers on the discussion of these difficulties and on the solution of a further question – viz. What is the cause of the perpetuity of coming-to-be? Why is there always unqualified, as well as partial, coming-to-be? Cause' in this connexion has two senses. It means (i) the source from which, as we say, the process 'originates', and (ii) the matter. It is the material cause that we have here to state. For, as to the other cause, we have already explained (in our treatise on Motion that it involves (a) something immovable through all time and (b) something always being moved. And the accurate treatment of the first of these – of the immovable 'originative source' – belongs to the province of the other, or 'prior', philosophy: while as regards 'that which sets everything else in motion by being itself continuously moved', we shall have to explain later' which amongst the so-called 'specific' causes exhibits this character. But at present we are to state the material cause – the cause classed under the head of matter – to which it is due that passing-away and coming-to-be never fail to occur in Nature. For perhaps, if we succeed in clearing up this question, it will simultaneously become clear what account we ought to give of that which perplexed us just now, i.e. of unqualified passing-away and coming-to-be.

Our new question too – viz. ‘what is the cause of the unbroken continuity of coming-to-be?’ – is sufficiently perplexing, if in fact what passes-away vanishes into ‘what is not’ and ‘what is not’ is nothing (since ‘what is not’ is neither a thing, nor possessed of a quality or quantity, nor in any place). If, then, some one of the things ‘which are’ constantly disappearing, why has not the whole of ‘what is’ been used up long ago and vanished away assuming of course that the material of all the several comings-to-be was finite? For, presumably, the unfailing continuity of coming-to-be cannot be attributed to the infinity of the material. That is impossible, for nothing is actually infinite. A thing is infinite only potentially, i.e. the dividing of it can continue indefinitely: so that we should have to suppose there is only one kind of coming-to-be in the world – viz. one which never fails, because it is such that what comes-to-be is on each successive occasion smaller than before. But in fact this is not what we see occurring.

Why, then, is this form of change necessarily ceaseless? Is it because the passing-away of this is a coming-to-be of something else, and the coming-to-be of this a passing-away of something else?

The cause implied in this solution must no doubt be considered adequate to account for coming-to-be and passing-away in their general character as they occur in all existing things alike. Yet, if the same process is a coming-to-be of this but a passing-away of that, and a passing-away of this but a coming-to-be of that, why are some things said to come-to-be and pass-away without qualification, but others only with a qualification?

The distinction must be investigated once more, for it demands some explanation. (It is applied in a twofold manner.) For (i) we say ‘it is now passing-away’ without qualification, and not merely ‘this is passing-away’: and we call this change ‘coming-

to-be', and that 'passing-away', without qualification. And (ii) so-and-so 'comes-to-be-something', but does not 'come-to-be' without qualification; for we say that the student 'comes-to-be-learned', not 'comes-to-be' without qualification.

(i) Now we often divide terms into those which signify a 'this somewhat' and those which do not. And (the first form of) the distinction, which we are investigating, results from a similar division of terms: for it makes a difference into what the changing thing changes. Perhaps, e.g. the passage into Fire is 'coming-to-be' unqualified, but 'passing-away-of-something' (e.g. Earth): whilst the coming-to-be of Earth is qualified (not unqualified) 'coming-to-be', though unqualified 'passing-away' (e.g. of Fire). This would be the case on the theory set forth in Parmenides: for he says that the things into which change takes place are two, and he asserts that these two, viz. what is and what is not, are Fire and Earth. Whether we postulate these, or other things of a similar kind, makes no difference. For we are trying to discover not what undergoes these changes, but what is their characteristic manner. The passage, then, into what 'is' not except with a qualification is unqualified passing-away, while the passage into what 'is' without qualification is unqualified coming-to-be. Hence whatever the contrasted 'poles' of the changes may be whether Fire and Earth, or some other couple – the one of them will be 'a being' and the other 'a not-being'.

We have thus stated one characteristic manner in which unqualified will be distinguished from qualified coming-to-be and passing-away: but they are also distinguished according to the special nature of the material of the changing thing. For a material, whose constitutive differences signify more a 'this somewhat', is itself more 'substantial' or 'real': while a material, whose constitutive differences signify privation, is 'not real'. (Suppose, e.g. that 'the hot' is a positive predication, i.e. a 'form',

whereas ‘cold’ is a privation, and that Earth and Fire differ from one another by these constitutive differences.)

The opinion, however, which most people are inclined to prefer, is that the distinction depends upon the difference between ‘the perceptible’ and ‘the imperceptible’. Thus, when there is a change into perceptible material, people say there is ‘coming-to-be’; but when there is a change into invisible material, they call it ‘passing-away’. For they distinguish ‘what is’ and ‘what is not’ by their perceiving and not-perceiving, just as what is knowable ‘is’ and what is unknowable ‘is not’ – perception on their view having the force of knowledge. Hence, just as they deem themselves to live and to ‘be’ in virtue of their perceiving or their capacity to perceive, so too they deem the things to ‘be’ qua perceived or perceptible – and in this they are in a sense on the track of the truth, though what they actually say is not true.

Thus unqualified coming-to-be and passing-away turn out to be different according to common opinion from what they are in truth. For Wind and Air are in truth more real more a ‘this somewhat’ or a ‘form’ – than Earth. But they are less real to perception which explains why things are commonly said to ‘pass-away’ without qualification when they change into Wind and Air, and to ‘come-to-be’ when they change into what is tangible, i.e. into Earth.

We have now explained why there is ‘unqualified coming-to-be’ (though it is a passing-away-of-something) and ‘unqualified passing-away’ (though it is a coming-to-be-of-something). For this distinction of appellation depends upon a difference in the material out of which, and into which, the changes are effected. It depends either upon whether the material is or is not ‘substantial’, or upon whether it is more or less ‘substantial’, or upon whether it is more or less perceptible.

(ii) But why are some things said to 'come-to-be' without qualification, and others only to 'come-to-be-so-and-so', in cases different from the one we have been considering where two things come-to-be reciprocally out of one another? For at present we have explained no more than this: – why, when two things change reciprocally into one another, we do not attribute coming-to-be and passing-away uniformly to them both, although every coming-to-be is a passing-away of something else and every passing-away some other thing's coming-to-be. But the question subsequently formulated involves a different problem – viz. why, although the learning thing is said to 'come-to-be-learned' but not to 'come-to-be' without qualification, yet the growing thing is said to 'come-to-be'.

The distinction here turns upon the difference of the Categories. For some things signify a this somewhat, others a such, and others a so-much. Those things, then, which do not signify substance, are not said to 'come-to-be' without qualification, but only to 'come-to-be-so-and-so'. Nevertheless, in all changing things alike, we speak of 'coming-to-be' when the thing comes-to-be something in one of the two Columns – e.g. in Substance, if it comes-to-be Fire but not if it comes-to-be Earth; and in Quality, if it comes-to-be learned but not when it comes-to-be ignorant.

We have explained why some things come-to-be without qualification, but not others both in general, and also when the changing things are substances and nothing else; and we have stated that the substratum is the material cause of the continuous occurrence of coming-to-be, because it is such as to change from contrary to contrary and because, in substances, the coming-to-be of one thing is always a passing-away of another, and the passing-away of one thing is always another's coming-to-be. But there is no need even to discuss the other question we raised – viz. why coming-to-be continues though

things are constantly being destroyed. For just as people speak of 'a passing-away' without qualification when a thing has passed into what is imperceptible and what in that sense 'is not', so also they speak of 'a coming-to-be out of a not-being' when a thing emerges from an imperceptible. Whether, therefore, the substratum is or is not something, what comes-to-be emerges out of a 'not-being': so that a thing comes-to-be out of a not-being' just as much as it 'passes-away into what is not'. Hence it is reasonable enough that coming-to-be should never fail. For coming-to-be is a passing-away of 'what is not' and passing-away is a coming-to-be of 'what is not'.

But what about that which 'is' not except with a qualification? Is it one of the two contrary poles of the change – e.g. Earth (i.e. the heavy) a 'not-being', but Fire (i.e. the light) a 'being'? Or, on the contrary, does what is 'include Earth as well as Fire, whereas what is not' is matter – the matter of Earth and Fire alike? And again, is the matter of each different? Or is it the same, since otherwise they would not come-to-be reciprocally out of one another, i.e. contraries out of contraries? For these things – Fire, Earth, Water, Air – are characterized by 'the contraries'.

Perhaps the solution is that their matter is in one sense the same, but in another sense different. For that which underlies them, whatever its nature may be qua underlying them, is the same: but its actual being is not the same. So much, then, on these topics.

4

Next we must state what the difference is between coming-to-be and 'alteration' – for we maintain that these changes are distinct from one another.

Since, then, we must distinguish (a) the substratum, and (b) the property whose nature it is to be predicated of the substratum; and since change of each of these occurs; there is 'alteration' when the substratum is perceptible and persists, but changes in its own properties, the properties in question being opposed to one another either as contraries or as intermediates. The body, e.g. although persisting as the same body, is now healthy and now ill; and the bronze is now spherical and at another time angular, and yet remains the same bronze. But when nothing perceptible persists in its identity as a substratum, and the thing changes as a whole (when e.g. the seed as a whole is converted into blood, or water into air, or air as a whole into water), such an occurrence is no longer 'alteration'. It is a coming-to-be of one substance and a passing-away of the other – especially if the change proceeds from an imperceptible something to something perceptible (either to touch or to all the senses), as when water comes-to-be out of, or passes-away into, air: for air is pretty well imperceptible. If, however, in such cases, any property (being one of a pair of contraries) persists, in the thing that has come-to-be, the same as it was in the thing which has passed-away – if, e.g. when water comes-to-be out of air, both are transparent or cold – the second thing, into which the first changes, must not be a property of this persistent identical something. Otherwise the change will be 'alteration.' Suppose, e.g. that the musical man passed-away and an unmusical man came-to-be, and that the man persists as something identical. Now, if 'musicalness and unmusicalness' had not been a property essentially inhering in man, these changes would have been a coming-to-be of unmusicalness and a passing-away of musicalness: but in fact 'musicalness and unmusicalness' are a property of the persistent identity, viz. man. (Hence, as regards man, these changes are 'modifications'; though, as regards musical man and unmusical man, they are a passing-away and a coming-to-be.) Consequently such changes

are 'alteration.' When the change from contrary to contrary is in quantity, it is 'growth and diminution'; when it is in place, it is 'motion'; when it is in property, i.e. in quality, it is 'alteration': but, when nothing persists, of which the resultant is a property (or an 'accident' in any sense of the term), it is 'coming-to-be', and the converse change is 'passing-away'.

'Matter', in the most proper sense of the term, is to be identified with the substratum which is receptive of coming-to-be and passing-away: but the substratum of the remaining kinds of change is also, in a certain sense, 'matter', because all these substrata are receptive of 'contrarieties' of some kind. So much, then, as an answer to the questions (i) whether coming-to-be 'is' or 'is not' – i.e. what are the precise conditions of its occurrence and (ii) what 'alteration' is: but we have still to treat of growth.

5

We must explain (i) wherein growth differs from coming-to-be and from 'alteration', and ii) what is the process of growing and the sprocess of diminishing in each and all of the things that grow and diminish.

Hence our first question is this: Do these changes differ from one another solely because of a difference in their respective 'spheres'? In other words, do they differ because, while a change from this to that (viz. from potential to actual substance) is coming-to-be, a change in the sphere of magnitude is growth and one in the sphere of quality is 'alteration' – both growth and 'alteration' being changes from what is-potentially to what is-actually magnitude and quality respectively? Or is there also a difference in the manner of the change, since it is evident that, whereas neither what is 'altering' nor what is coming-to-be

necessarily changes its place, what is growing or diminishing changes its spatial position of necessity, though in a different manner from that in which the moving thing does so? For that which is being moved changes its place as a whole: but the growing thing changes its place like a metal that is being beaten, retaining its position as a whole while its parts change their places. They change their places, but not in the same way as the parts of a revolving globe. For the parts of the globe change their places while the whole continues to occupy an equal place: but the parts of the rowing thing expand over an ever-increasing place and the parts of the diminishing thing contract within an ever-diminishing area.

It is clear, then, that these changes – the changes of that which is coming-to-be, of that which is 'altering', and of that which is growing – differ in manner as well as in sphere. But how are we to conceive the 'sphere' of the change which is growth and diminution? The sphere' of growing and diminishing is believed to be magnitude. Are we to suppose that body and magnitude come-to-be out of something which, though potentially magnitude and body, is actually incorporeal and devoid of magnitude? And since this description may be understood in two different ways, in which of these two ways are we to apply it to the process of growth? Is the matter, out of which growth takes place, (i) 'separate' and existing alone by itself, or (ii) 'separate' but contained in another body?

Perhaps it is impossible for growth to take place in either of these ways. For since the matter is 'separate', either (a) it will occupy no place (as if it were a point), or (b) it will be a 'void', i.e. a non-perceptible body. But the first of these alternatives is impossible. For since what comes-to-be out of this incorporeal and sizeless something will always be 'somewhere', it too must be 'somewhere' – either intrinsically or indirectly. And the second alternative necessarily implies that the matter is

contained in some other body. But if it is to be ‘in’ another body and yet remains ‘separate’ in such a way that it is in no sense a part of that body (neither a part of its substantial being nor an ‘accident’ of it), many impossibilities will result. It is as if we were to suppose that when, e.g. air comes-to-be out of water the process were due not to a change of the but to the matter of the air being ‘contained in’ the water as in a vessel. This is impossible. For (i) there is nothing to prevent an indeterminate number of matters being thus ‘contained in’ the water, so that they might come-to-be actually an indeterminate quantity of air; and (ii) we do not in fact see air coming-to-be out of water in this fashion, viz. withdrawing out of it and leaving it unchanged.

It is therefore better to suppose that in all instances of coming-to-be the matter is inseparable, being numerically identical and one with the ‘containing’ body, though isolable from it by definition. But the same reasons also forbid us to regard the matter, out of which the body comes-to-be, as points or lines. The matter is that of which points and lines are limits, and it is something that can never exist without quality and without form.

Now it is no doubt true, as we have also established elsewhere,’ that one thing ‘comes-to-be’ (in the unqualified sense) out of another thing: and further it is true that the efficient cause of its coming-to-be is either (i) an actual thing (which is the same as the effect either generically – or the efficient cause of the coming-to-be of a hard thing is not a hard thing or specifically, as e.g. fire is the efficient cause of the coming-to-be of fire or one man of the birth of another), or (ii) an actuality. Nevertheless, since there is also a matter out of which corporeal substance itself comes-to-be (corporeal substance, however, already characterized as such-and-such a determinate body, for there is no such thing as body in general), this same matter is

also the matter of magnitude and quality – being separable from these matters by definition, but not separable in place unless Qualities are, in their turn, separable.

It is evident, from the preceding development and discussion of difficulties, that growth is not a change out of something which, though potentially a magnitude, actually possesses no magnitude. For, if it were, the 'void' would exist in separation; but we have explained in a former work' that this is impossible. Moreover, a change of that kind is not peculiarly distinctive of growth, but characterizes coming-to-be as such or in general. For growth is an increase, and diminution is a lessening, of the magnitude which is there already – that, indeed, is why the growing thing must possess some magnitude. Hence growth must not be regarded as a process from a matter without magnitude to an actuality of magnitude: for this would be a body's coming-to-be rather than its growth.

We must therefore come to closer quarters with the subject of our inquiry. We must grapple' with it (as it were) from its beginning, and determine the precise character of the growing and diminishing whose causes we are investigating.

It is evident (i) that any and every part of the growing thing has increased, and that similarly in diminution every part has become smaller: also (ii) that a thing grows by the accession, and diminishes by the departure, of something. Hence it must grow by the accession either (a) of something incorporeal or (b) of a body. Now, if (a) it grows by the accession of something incorporeal, there will exist separate a void: but (as we have stated before)' is impossible for a matter of magnitude to exist 'separate'. If, on the other hand (b) it grows by the accession of a body, there will be two bodies – that which grows and that which increases it – in the same place: and this too is impossible.

But neither is it open to us to say that growth or diminution occurs in the way in which e.g. air is generated from water. For, although the volume has then become greater, the change will not be growth, but a coming-to-be of the one – viz. of that into which the change is taking place – and a passing-away of the contrasted body. It is not a growth of either. Nothing grows in the process; unless indeed there be something common to both things (to that which is coming-to-be and to that which passed-away), e.g. 'body', and this grows. The water has not grown, nor has the air: but the former has passed-away and the latter has come-to-be, and – if anything has grown – there has been a growth of 'body.' Yet this too is impossible. For our account of growth must preserve the characteristics of that which is growing and diminishing. And these characteristics are three: (i) any and every part of the growing magnitude is made bigger (e.g. if flesh grows, every particle of the flesh gets bigger), (ii) by the accession of something, and (iii) in such a way that the growing thing is preserved and persists. For whereas a thing does not persist in the processes of unqualified coming-to-be or passing-away, that which grows or 'alters' persists in its identity through the 'altering' and through the growing or diminishing, though the quality (in 'alteration') and the size (in growth) do not remain the same. Now if the generation of air from water is to be regarded as growth, a thing might grow without the accession (and without the persistence) of anything, and diminish without the departure of anything – and that which grows need not persist. But this characteristic must be preserved: for the growth we are discussing has been assumed to be thus characterized.

One might raise a further difficulty. What is 'that which grows'? Is it that to which something is added? If, e.g. a man grows in his shin, is it the shin which is greater – but not that 'whereby' he grows, viz. not the food? Then why have not both 'grown'? For when A is added to B, both A and B are greater, as when you

mix wine with water; for each ingredient is alike increased in volume. Perhaps the explanation is that the substance of the one remains unchanged, but the substance of the other (viz. of the food) does not. For indeed, even in the mixture of wine and water, it is the prevailing ingredient which is said to have increased in volume. We say, e.g. that the wine has increased, because the whole mixture acts as wine but not as water. A similar principle applies also to 'alteration'. Flesh is said to have been 'altered' if, while its character and substance remain, some one of its essential properties, which was not there before, now qualifies it: on the other hand, that 'whereby' it has been 'altered' may have undergone no change, though sometimes it too has been affected. The altering agent, however, and the originative source of the process are in the growing thing and in that which is being 'altered': for the efficient cause is in these. No doubt the food, which has come in, may sometimes expand as well as the body that has consumed it (that is so, e.g. if, after having come in, a food is converted into wind), but when it has undergone this change it has passedaway: and the efficient cause is not in the food.

We have now developed the difficulties sufficiently and must therefore try to find a solution of the problem. Our solution must preserve intact the three characteristics of growth – that the growing thing persists, that it grows by the accession (and diminishes by the departure) of something, and further that every perceptible particle of it has become either larger or smaller. We must recognize also (a) that the growing body is not 'void' and that yet there are not two magnitudes in the same place, and (b) that it does not grow by the accession of something incorporeal.

Two preliminary distinctions will prepare us to grasp the cause of growth. We must note (i) that the organic parts grow by the growth of the tissues (for every organ is composed of these as

its constituents); and (ii) that flesh, bone, and every such part – like every other thing which has its form immersed in matter – has a twofold nature: for the form as well as the matter is called ‘flesh’ or ‘bone’.

Now, that any and every part of the tissue qua form should grow – and grow by the accession of something – is possible, but not that any and every part of the tissue qua matter should do so. For we must think of the tissue after the image of flowing water that is measured by one and the same measure: particle after particle comes-to-be, and each successive particle is different. And it is in this sense that the matter of the flesh grows, some flowing out and some flowing in fresh; not in the sense that fresh matter accedes to every particle of it. There is, however, an accession to every part of its figure or ‘form’.

That growth has taken place proportionally, is more manifest in the organic parts – e.g. in the hand. For there the fact that the matter is distinct from the form is more manifest than in flesh, i.e. than in the tissues. That is why there is a greater tendency to suppose that a corpse still possesses flesh and bone than that it still has a hand or an arm.

Hence in one sense it is true that any and every part of the flesh has grown; but in another sense it is false. For there has been an accession to every part of the flesh in respect to its form, but not in respect to its matter. The whole, however, has become larger. And this increase is due (a) on the one hand to the accession of something, which is called ‘food’ and is said to be ‘contrary’ to flesh, but (b) on the other hand to the transformation of this food into the same form as that of flesh as if, e.g. ‘moist’ were to accede to ‘dry’ and, having acceded, were to be transformed and to become ‘dry’. For in one sense ‘Like grows by Like’, but in another sense ‘Unlike grows by Unlike’.

One might discuss what must be the character of that 'whereby' a thing grows. Clearly it must be potentially that which is growing – potentially flesh, e.g. if it is flesh that is growing. Actually, therefore, it must be 'other' than the growing thing. This 'actual other', then, has passed-away and come-to-be flesh. But it has not been transformed into flesh alone by itself (for that would have been a coming-to-be, not a growth): on the contrary, it is the growing thing which has come-to-be flesh (and grown) by the food. In what way, then, has the food been modified by the growing thing? Perhaps we should say that it has been 'mixed' with it, as if one were to pour water into wine and the wine were able to convert the new ingredient into wine. And as fire lays hold of the inflammable, so the active principle of growth, dwelling in the growing thing that which is actually flesh), lays hold of an acceding food which is potentially flesh and converts it into actual flesh. The acceding food, therefore, must be together with the growing thing: for if it were apart from it, the change would be a coming-to-be. For it is possible to produce fire by piling logs on to the already burning fire. That is 'growth'. But when the logs themselves are set on fire, that is 'coming-to-be'.

'Quantum-in-general' does not come-to-be any more than 'animal' which is neither man nor any other of the specific forms of animal: what 'animal-in-general' is in coming-to-be, that 'quantum-in-general' is in growth. But what does come-to-be in growth is flesh or bone – or a hand or arm (i.e. the tissues of these organic parts). Such things come-to-be, then, by the accession not of quantified-flesh but of a quantified-something. In so far as this acceding food is potentially the double result e.g. is potentially so-much-flesh it produces growth: for it is bound to become actually both so-much and flesh. But in so far as it is potentially flesh only, it nourishes: for it is thus that 'nutrition' and 'growth' differ by their definition. That is why a body's 'nutrition' continues so long as it is kept alive (even when

it is diminishing), though not its 'growth'; and why nutrition, though 'the same' as growth, is yet different from it in its actual being. For in so far as that which accedes is potentially 'so much-flesh' it tends to increase flesh: whereas, in so far as it is potentially 'flesh' only, it is nourishment.

The form of which we have spoken is a kind of power immersed in matter – a duct, as it were. If, then, a matter accedes – a matter, which is potentially a duct and also potentially possesses determinate quantity the ducts to which it accedes will become bigger. But if it is no longer able to act – if it has been weakened by the continued influx of matter, just as water, continually mixed in greater and greater quantity with wine, in the end makes the wine watery and converts it into water – then it will cause a diminution of the quantum; though still the form persists.

6

(In discussing the causes of coming-to-be) we must first investigate the matter, i.e. the so-called 'elements'. We must ask whether they really are clements or not, i.e. whether each of them is eternal or whether there is a sense in which they come-to-be: and, if they do come-to-be, whether all of them come-to-be in the same manner reciprocally out of one another, or whether one amongst them is something primary. Hence we must begin by explaining certain preliminary matters, about which the statements now current are vague.

For all (the pluralist philosophers) – those who generate the 'elements' as well as those who generate the bodies that are compounded of the elements – make use of 'dissociation' and 'association', and of 'action' and 'passion'. Now 'association' is

‘combination’; but the precise meaning of the process we call ‘combining’ has not been explained. Again, (all the monists make use of ‘alteration’: but) without an agent and a patient there cannot be ‘altering’ any more than there can be ‘dissociating’ and ‘associating’. For not only those who postulate a plurality of elements employ their reciprocal action and passion to generate the compounds: those who derive things from a single element are equally compelled to introduce ‘acting’. And in this respect Diogenes is right when he argues that ‘unless all things were derived from one, reciprocal action and passion could not have occurred’. The hot thing, e.g. would not be cooled and the cold thing in turn be warmed: for heat and cold do not change reciprocally into one another, but what changes (it is clear) is the substratum. Hence, whenever there is action and passion between two things, that which underlies them must be a single something. No doubt, it is not true to say that all things are of this character: but it is true of all things between which there is reciprocal action and passion.

But if we must investigate ‘action-passion’ and ‘combination’, we must also investigate ‘contact’. For action and passion (in the proper sense of the terms) can only occur between things which are such as to touch one another; nor can things enter into combination at all unless they have come into a certain kind of contact. Hence we must give a definite account of these three things – of ‘contact’, ‘combination’, and ‘acting’.

Let us start as follows. All things which admit of ‘combination’ must be capable of reciprocal contact: and the same is true of any two things, of which one ‘acts’ and the other ‘suffers action’ in the proper sense of the terms. For this reason we must treat of ‘contact’ first. every term which possesses a variety of meaning includes those various meanings either owing to a mere coincidence of language, or owing to a real order of derivation in the different things to which it is applied: but,

though this may be taken to hold of ‘contact’ as of all such terms, it is nevertheless true that contact’ in the proper sense applies only to things which have ‘position’. And ‘position’ belongs only to those things which also have a Place’: for in so far as we attribute ‘contact’ to the mathematical things, we must also attribute ‘place’ to them, whether they exist in separation or in some other fashion. Assuming, therefore, that ‘to touch’ is – as we have defined it in a previous work – ‘to have the extremes together’, only those things will touch one another which, being separate magnitudes and possessing position, have their extremes ‘together’. And since position belongs only to those things which also have a ‘place’, while the primary differentiation of ‘place’ is the above’ and ‘the below’ (and the similar pairs of opposites), all things which touch one another will have ‘weight’ or ‘lightness’ either both these qualities or one or the other of them. But bodies which are heavy or light are such as to ‘act’ and ‘suffer action’. Hence it is clear that those things are by nature such as to touch one another, which (being separate magnitudes) have their extremes ‘together’ and are able to move, and be moved by, one another.

The manner in which the ‘mover’ moves the moved’ not always the same: on the contrary, whereas one kind of ‘mover’ can only impart motion by being itself moved, another kind can do so though remaining itself unmoved. Clearly therefore we must recognize a corresponding variety in speaking of the ‘acting’ thing too: for the ‘mover’ is said to ‘act’ (in a sense) and the ‘acting’ thing to ‘impart motion’. Nevertheless there is a difference and we must draw a distinction. For not every ‘mover’ can ‘act’, if (a) the term ‘agent’ is to be used in contrast to ‘patient’ and (b) ‘patient’ is to be applied only to those things whose motion is a ‘qualitative affection’ – i.e. a quality, like white’ or ‘hot’, in respect to which they are moved’ only in the sense that they are ‘altered’: on the contrary, to ‘impart motion’ is a wider term than to ‘act’. Still, so much, at any rate, is clear:

the things which are 'such as to impart motion', if that description be interpreted in one sense, will touch the things which are 'such as to be moved by them' – while they will not touch them, if the description be interpreted in a different sense. But the disjunctive definition of 'touching' must include and distinguish (a) 'contact in general' as the relation between two things which, having position, are such that one is able to impart motion and the other to be moved, and (b) 'reciprocal contact' as the relation between two things, one able to impart motion and the other able to be moved in such a way that 'action and passion' are predicable of them.

As a rule, no doubt, if A touches B, B touches A. For indeed practically all the 'movers' within our ordinary experience impart motion by being moved: in their case, what touches inevitably must, and also evidently does, touch something which reciprocally touches it. Yet, if A moves B, it is possible – as we sometimes express it – for A 'merely to touch' B, and that which touches need not touch a something which touches it. Nevertheless it is commonly supposed that 'touching' must be reciprocal. The reason of this belief is that 'movers' which belong to the same kind as the 'moved' impart motion by being moved. Hence if anything imparts motion without itself being moved, it may touch the 'moved' and yet itself be touched by nothing – for we say sometimes that the man who grieves us 'touches' us, but not that we 'touch' him.

The account just given may serve to distinguish and define the 'contact' which occurs in the things of Nature.

7

Next in order we must discuss 'action' and 'passion'. The traditional theories on the subject are conflicting. For (i) most thinkers are unanimous in maintaining (a) that 'like' is always unaffected by 'like', because (as they argue) neither of two 'likes' is more apt than the other either to act or to suffer action, since all the properties which belong to the one belong identically and in the same degree to the other; and (b) that 'unlikes', i.e. 'differents', are by nature such as to act and suffer action reciprocally. For even when the smaller fire is destroyed by the greater, it suffers this effect (they say) owing to its 'contrariety' since the great is contrary to the small. But (ii) Democritus dissented from all the other thinkers and maintained a theory peculiar to himself. He asserts that agent and patient are identical, i.e. 'like'. It is not possible (he says) that 'others', i.e. 'differents', should suffer action from one another: on the contrary, even if two things, being 'others', do act in some way on one another, this happens to them not qua 'others' but qua possessing an identical property.

Such, then, are the traditional theories, and it looks as if the statements of their advocates were in manifest conflict. But the reason of this conflict is that each group is in fact stating a part, whereas they ought to have taken a comprehensive view of the subject as a whole. For (i) if A and B are 'like' – absolutely and in all respects without difference from one another – it is reasonable to infer that neither is in any way affected by the other. Why, indeed, should either of them tend to act any more than the other? Moreover, if 'like' can be affected by 'like', a thing can also be affected by itself: and yet if that were so – if 'like' tended in fact to act qua 'like' – there would be nothing indestructible or immovable, for everything would move itself. And (ii) the same consequence follows if A and B are absolutely 'other', i.e. in no respect identical. Whiteness could not be

affected in any way by line nor line by whiseness – except perhaps ‘coincidentally’, viz. if the line happened to be white or black: for unless two things either are, or are composed of, ‘contraries’, neither drives the other out of its natural condition. But (iii) since only those things which either involve a ‘contrariety’ or are ‘contraries’ – and not any things selected at random – are such as to suffer action and to act, agent and patient must be ‘like’ (i.e. identical) in kind and yet ‘unlike’ (i.e. contrary) in species. (For it is a law of nature that body is affected by body, flavour by flavour, colour by colour, and so in general what belongs to any kind by a member of the same kind – the reason being that ‘contraries’ are in every case within a single identical kind, and it is ‘contraries’ which reciprocally act and suffer action.) Hence agent and patient must be in one sense identical, but in another sense other than (i.e. ‘unlike’) one another. And since (a) patient and agent are generically identical (i.e. ‘like’) but specifically ‘unlike’, while (b) it is ‘contraries’ that exhibit this character: it is clear that ‘contraries’ and their ‘intermediates’ are such as to suffer action and to act reciprocally – for indeed it is these that constitute the entire sphere of passing-away and coming-to-be.

We can now understand why fire heats and the cold thing cools, and in general why the active thing assimilates to itself the patient. For agent and patient are contrary to one another, and coming-to-be is a process into the contrary: hence the patient must change into the agent, since it is only thus that coming-to-be will be a process into the contrary. And, again, it is intelligible that the advocates of both views, although their theories are not the same, are yet in contact with the nature of the facts. For sometimes we speak of the substratum as suffering action (e.g. of ‘the man’ as being healed, being warmed and chilled, and similarly in all the other cases), but at other times we say ‘what is cold is ‘being warmed’, ‘what is sick is being healed’: and in both these ways of speaking we express the truth, since in one

sense it is the ‘matter’, while in another sense it is the ‘contrary’, which suffers action. (We make the same distinction in speaking of the agent: for sometimes we say that ‘the man’, but at other times that ‘what is hot’, produces heat.) Now the one group of thinkers supposed that agent and patient must possess something identical, because they fastened their attention on the substratum: while the other group maintained the opposite because their attention was concentrated on the ‘contraries’. We must conceive the same account to hold of action and passion as that which is true of ‘being moved’ and ‘imparting motion’. For the ‘mover’, like the ‘agent’, has two meanings. Both (a) that which contains the originative source of the motion is thought to ‘impart motion’ (for the originative source is first amongst the causes), and also (b) that which is last, i.e. immediately next to the moved thing and to the coming-to-be. A similar distinction holds also of the agent: for we speak not only (a) of the doctor, but also (b) of the wine, as healing. Now, in motion, there is nothing to prevent the firs; mover being unmoved (indeed, as regards some ‘first’ movers’ this is actually necessary) although the last mover always imparts motion by being itself moved: and, in action, there is nothing to prevent the first agent being unaffected, while the last agent only acts by suffering action itself. For agent and patient have not the same matter, agent acts without being affected: thus the art of healing produces health without itself being acted upon in any way by that which is being healed. But (b) the food, in acting, is itself in some way acted upon: for, in acting, it is simultaneously heated or cooled or otherwise affected. Now the art of healing corresponds to an ‘originative source’, while the food corresponds to ‘the last’ (i.e. ‘continuous’) mover.

Those active powers, then, whose forms are not embodied in matter, are unaffected: but those whose forms are in matter are such as to be affected in acting. For we maintain that one and

the same 'matter' is equally, so to say, the basis of either of the two opposed things – being as it were a 'kind'; and that that which can he hot must be made hot, provided the heating agent is there, i.e. comes near. Hence (as we have said) some of the active powers are unaffected while others are such as to be affected; and what holds of motion is true also of the active powers. For as in motion 'the first mover' is unmoved, so among the active powers 'the first agent' is unaffected.

The active power is a 'cause' in the sense of that from which the process originates: but the end, for the sake of which it takes place, is not 'active'. (That is why health is not 'active', except metaphorically.) For when the agent is there, the patient becomes something: but when 'states' are there, the patient no longer becomes but already is – and 'forms' (i.e. 'lends') are a kind of 'state'. As to the 'matter', it (qua matter) is passive. Now fire contains 'the hot' embodied in matter: but a 'hot' separate from matter (if such a thing existed) could not suffer any action. Perhaps, indeed, it is impossible that 'the hot' should exist in separation from matter: but if there are any entities thus separable, what we are saying would be true of them.

We have thus explained what action and passion are, what things exhibit them, why they do so, and in what manner. We must go on to discuss how it is possible for action and passion to take place.

8

Some philosophers think that the 'last' agent – the 'agent' in the strictest sense – enters in through certain pores, and so the patient suffers action. It is in this way, they assert, that we see and hear and exercise all our other senses. Moreover, according

to them, things are seen through air and water and other transparent bodies, because such bodies possess pores, invisible indeed owing to their minuteness, but close-set and arranged in rows: and the more transparent the body, the more frequent and serial they suppose its pores to be. Such was the theory which some philosophers (induding Empedocles) advanced in regard to the structure of certain bodies. They do not restrict it to the bodies which act and suffer action: but 'combination' too, they say, takes place 'only between bodies whose pores are in reciprocal symmetry'. The most systematic and consistent theory, however, and one that applied to all bodies, was advanced by Leucippus and Democritus: and, in maintaining it, they took as their starting-point what naturally comes first.

For some of the older philosophers thought that 'what is' must of necessity be 'one' and immovable. The void, they argue, 'is not': but unless there is a void with a separate being of its own, 'what is' cannot be moved – nor again can it be 'many', since there is nothing to keep things apart. And in this respect, they insist, the view that the universe is not 'continuous' but 'discretes-in-contact' is no better than the view that there are 'many' (and not 'one') and a void. For (suppose that the universe is discretes-in-contact. Then), if it is divisible through and through, there is no 'one', and therefore no 'many' either, but the Whole is void; while to maintain that it is divisible at some points, but not at others, looks like an arbitrary fiction. For up to what limit is it divisible? And for what reason is part of the Whole indivisible, i.e. a plenum, and part divided? Further, they maintain, it is equally necessary to deny the existence of motion.

Reasoning in this way, therefore, they were led to transcend sense-perception, and to disregard it on the ground that 'one ought to follow the argument': and so they assert that the universe is 'one' and immovable. Some of them add that it is

'infinite', since the limit (if it had one) would be a limit against the void.

There were, then, certain thinkers who, for the reasons we have stated, enunciated views of this kind as their theory of 'The Truth'.... Moreover, although these opinions appear to follow logically in a dialectical discussion, yet to believe them seems next door to madness when one considers the facts. For indeed no lunatic seems to be so far out of his senses as to suppose that fire and ice are 'one': it is only between what is right and what seems right from habit, that some people are mad enough to see no difference.

Leucippus, however, thought he had a theory which harmonized with sense-perception and would not abolish either coming-to-be and passing-away or motion and the multiplicity of things. He made these concessions to the facts of perception: on the other hand, he conceded to the Monists that there could be no motion without a void. The result is a theory which he states as follows: 'The void is a «not being», and no part of «what is» is a «not-being»; for what «is» in the strict sense of the term is an absolute plenum. This plenum, however, is not «one»: on the contrary, it is a many» infinite in number and invisible owing to the minuteness of their bulk. The «many» move in the void (for there is a void): and by coming together they produce «coming-to-be», while by separating they produce «passing-away». Moreover, they act and suffer action wherever they chance to be in contact (for there they are not «one»), and they generate by being put together and becoming intertwined. From the genuinely-one, on the other hand, there never could have come-to-be a multiplicity, nor from the genuinely-many a «one»: that is impossible. But (just as Empedocles and some of the other philosophers say that things suffer action through their pores, so) 'all «alteration» and all «passion» take place in the way that has been explained: breaking-up (i.e. passing-away) is effected

by means of the void, and so too is growth-solids creeping in to fill the void places.' Empedocles too is practically bound to adopt the same theory as Leucippus. For he must say that there are certain solids which, however, are indivisible – unless there are continuous pores all through the body. But this last alternative is impossible: for then there will be nothing solid in the body (nothing beside the pores) but all of it will be void. It is necessary, therefore, for his 'contiguous discretes' to be indivisible, while the intervals between them – which he calls 'pores' – must be void. But this is precisely Leucippus' theory of action and passion.

Such, approximately, are the current explanations of the manner in which some things 'act' while others 'suffer action'. And as regards the Atomists, it is not only clear what their explanation is: it is also obvious that it follows with tolerable consistency from the assumptions they employ. But there is less obvious consistency in the explanation offered by the other thinkers. It is not clear, for instance, how, on the theory of Empedocles, there is to be 'passing-away' as well as 'alteration'. For the primary bodies of the Atomists – the primary constituents of which bodies are composed, and the ultimate elements into which they are dissolved – are indivisible, differing from one another only in figure. In the philosophy of Empedocles, on the other hand, it is evident that all the other bodies down to the 'elements' have their coming-to-be and their passing-away: but it is not clear how the 'elements' themselves, severally in their aggregated masses, come-to-be and pass-away. Nor is it possible for Empedocles to explain how they do so, since he does not assert that Fire too (and similarly every one of his other 'elements') possesses 'elementary constituents' of itself.

Such an assertion would commit him to doctrines like those which Plato has set forth in the Timaeus. For although both

Plato and Leucippus postulate elementary constituents that are indivisible and distinctively characterized by figures, there is this great difference between the two theories: the 'indivisibles' of Leucippus (i) are solids, while those of Plato are planes, and (ii) are characterized by an infinite variety of figures, while the characterizing figures employed by Plato are limited in number. Thus the 'comings-to-be' and the 'dissociations' result from the 'indivisibles' (a) according to Leucippus through the void and through contact (for it is at the point of contact that each of the composite bodies is divisible), but (b) according to Plato in virtue of contact alone, since he denies there is a void.

Now we have discussed 'indivisible planes' in the preceding treatise.' But with regard to the assumption of 'indivisible solids', although we must not now enter upon a detailed study of its consequences, the following criticisms fall within the compass of a short digression: i. The Atomists are committed to the view that every 'indivisible' is incapable alike of receiving a sensible property (for nothing can 'suffer action' except through the void) and of producing one – no 'indivisible' can be, e.g. either hard or cold. Yet it is surely a paradox that an exception is made of 'the hot' – 'the hot' being assigned as peculiar to the spherical figure: for, that being so, its 'contrary' also ('the cold') is bound to belong to another of the figures. If, however, these properties (heat and cold) do belong to the 'indivisibles', it is a further paradox that they should not possess heaviness and lightness, and hardness and softness. And yet Democritus says 'the more any indivisible exceeds, the heavier it is' – to which we must clearly add 'and the hotter it is'. But if that is their character, it is impossible they should not be affected by one another: the 'slightly-hot indivisible', e.g. will inevitably suffer action from one which far exceeds it in heat. Again, if any 'indivisible' is 'hard', there must also be one which is 'soft': but 'the soft' derives its very name from the fact that it suffers a certain action – for 'soft' is that which yields to pressure.

II. But further, not only is it paradoxical (i) that no property except figure should belong to the ‘indivisibles’: it is also paradoxical (ii) that, if other properties do belong to them, one only of these additional properties should attach to each – e.g. that this ‘indivisible’ should be cold and that ‘indivisible’ hot. For, on that supposition, their substance would not even be uniform. And it is equally impossible (iii) that more than one of these additional properties should belong to the single ‘indivisible’. For, being indivisible, it will possess these properties in the same point – so that, if it ‘suffers action’ by being chilled, it will also, qua chilled, ‘act’ or ‘suffer action’ in some other way. And the same line of argument applies to all the other properties too: for the difficulty we have just raised confronts, as a necessary consequence, all who advocate ‘indivisibles’ (whether solids or planes), since their ‘indivisibles’ cannot become either ‘rarer’ or ‘derser’ inasmuch as there is no void in them.

III. It is a further paradox that there should be small ‘indivisibles’, but not large ones. For it is natural enough, from the ordinary point of view, that the larger bodies should be more liable to fracture than the small ones, since they (viz. the large bodies) are easily broken up because they collide with many other bodies. But why should indivisibility as such be the property of small, rather than of large, bodies?

IV. Again, is the substance of all those solids uniform, or do they fall into sets which differ from one another – as if, e.g. some of them, in their aggregated bulk, were ‘fiery’, others earthy’? For (i) if all of them are uniform in substance, what is it that separated one from another? Or why, when they come into contact, do they not coalesce into one, as drops of water run together when drop touches drop (for the two cases are precisely parallel)? On the other hand (ii) if they fall into differing sets, how are these characterized? It is clear, too, that

these, rather than the 'figures', ought to be postulated as 'original reals', i.e. causes from which the phenomena result. Moreover, if they differed in substance, they would both act and suffer action on coming into reciprocal contact.

V. Again, what is it which sets them moving? For if their 'mover' is other than themselves, they are such as to 'suffer action'. If, on the other hand, each of them sets itself in motion, either (a) it will be divisible ('imparting motion' qua this, 'being moved' qua that), or (b) contrary properties will attach to it in the same respect – i.e. 'matter' will be identical in-potentiality as well as numerically-identical.

As to the thinkers who explain modification of property through the movement facilitated by the pores, if this is supposed to occur notwithstanding the fact that the pores are filled, their postulate of pores is superfluous. For if the whole body suffers action under these conditions, it would suffer action in the same way even if it had no pores but were just its own continuous self. Moreover, how can their account of 'vision through a medium' be correct? It is impossible for (the visual ray) to penetrate the transparent bodies at their 'contacts'; and impossible for it to pass through their pores if every pore be full. For how will that differ from having no pores at all? The body will be uniformly 'full' throughout. But, further, even if these passages, though they must contain bodies, are 'void', the same consequence will follow once more. And if they are 'too minute to admit any body', it is absurd to suppose there is a 'minute' void and yet to deny the existence of a 'big' one (no matter how small the 'big' may be), or to imagine 'the void' means anything else than a body's place – whence it clearly follows that to every body there will correspond a void of equal cubic capacity.

As a general criticism we must urge that to postulate pores is superfluous. For if the agent produces no effect by touching the

patient, neither will it produce any by passing through its pores. On the other hand, if it acts by contact, then – even without pores – some things will 'suffer action' and others will 'act', provided they are by nature adapted for reciprocal action and passion. Our arguments have shown that it is either false or futile to advocate pores in the sense in which some thinkers conceive them. But since bodies are divisible through and through, the postulate of pores is ridiculous: for, qua divisible, a body can fall into separate parts.

9

Let explain the way in which things in fact possess the power of generating, and of acting and suffering action: and let us start from the principle we have often enunciated. For, assuming the distinction between (a) that which is potentially and (b) that which is actually such-and-such, it is the nature of the first, precisely in so far as it is what it is, to suffer action through and through, not merely to be susceptible in some parts while insusceptible in others. But its susceptibility varies in degree, according as it is more or less; such-and-such, and one would be more justified in speaking of 'pores' in this connexion: for instance, in the metals there are veins of 'the susceptible' stretching continuously through the substance.

So long, indeed, as any body is naturally coherent and one, it is insusceptible. So, too, bodies are insusceptible so long as they are not in contact either with one another or with other bodies which are by nature such as to act and suffer action. (To illustrate my meaning: Fire heats not only when in contact, but also from a distance. For the fire heats the air, and the air – being by nature such as both to act and suffer action – heats the

body.) But the supposition that a body is 'susceptible in some parts, but insusceptible in others' (is only possible for those who hold an erroneous view concerning the divisibility of magnitudes. For us) the following account results from the distinctions we established at the beginning. For (i) if magnitudes are not divisible through and through – if, on the contrary, there are indivisible solids or planes – then indeed no body would be susceptible through and through :but neither would any be continuous. Since, however, (ii) this is false, i.e. since every body is divisible, there is no difference between 'having been divided into parts which remain in contact' and 'being divisible'. For if a body 'can be separated at the contacts' (as some thinkers express it), then, even though it has not yet been divided, it will be in a state of dividedness – since, as it can be divided, nothing inconceivable results. And (iii) the suposition is open to this general objection – it is a paradox that 'passion' should occur in this manner only, viz. by the bodies being split. For this theory abolishes 'alteration': but we see the same body liquid at one time and solid at another, without losing its continuity. It has suffered this change not by 'division' and composition', nor yet by 'turning' and 'intercontact' as Democritus asserts; for it has passed from the liquid to the solid state without any change of 'grouping' or 'position' in the constituents of its substance. Nor are there contained within it those 'hard' (i.e. congealed) particles 'indivisible in their bulk': on the contrary, it is liquid – and again, solid and congealed – uniformly all through. This theory, it must be added, makes growth and diminution impossible also. For if there is to be opposition (instead of the growing thing having changed as a whole, either by the admixture of something or by its own transformation), increase of size will not have resulted in any and every part.

So much, then, to establish that things generate and are generated, act and suffer action, reciprocally; and to distinguish

the way in which these processes can occur from the (impossible) way in which some thinkers say they occur.

10

But we have still to explain ‘combination’, for that was the third of the subjects we originally proposed to discuss. Our explanation will proceed on the same method as before. We must inquire: What is ‘combination’, and what is that which can ‘combine’? Of what things, and under what conditions, is ‘combination’ a property? And, further, does ‘combination’ exist in fact, or is it false to assert its existence?

For, according to some thinkers, it is impossible for one thing to be combined with another. They argue that (i) if both the ‘combined’ constituents persist unaltered, they are no more ‘combined’ now than they were before, but are in the same condition: while (ii) if one has been destroyed, the constituents have not been ‘combined’ – on the contrary, one constituent is and the other is not, whereas ‘combination’ demands uniformity of condition in them both: and on the same principle (iii) even if both the combining constituents have been destroyed as the result of their coalescence, they cannot ‘have been combined’ since they have no being at all.

What we have in this argument is, it would seem, a demand for the precise distinction of ‘combination’ from coming-to-be and passing-away (for it is obvious that ‘combination’, if it exists, must differ from these processes) and for the precise distinction of the ‘combinable’ from that which is such as to come-to-be and pass-away. As soon, therefore, as these distinctions are clear, the difficulties raised by the argument would be solved.

Now (i) we do not speak of the wood as 'combined' with the fire, nor of its burning as a 'combining' either of its particles with one another or of itself with the fire: what we say is that 'the fire is coming-to-be, but the wood is 'passing-away'. Similarly, we speak neither (ii) of the food as 'combining' with the body, nor (iii) of the shape as 'combining' with the wax and thus fashioning the lump. Nor can body 'combine' with white, nor (to generalize) 'properties' and 'states' with 'things': for we see them persisting unaltered. But again (iv) white and knowledge cannot be 'combined' either, nor any other of the 'adjectivals'. (Indeed, this is a blemish in the theory of those who assert that 'once upon a time all things were together and combined'. For not everything can 'combine' with everything. On the contrary, both of the constituents that are combined in the compound must originally have existed in separation: but no property can have separate existence.)

Since, however, some things are-potentially while others are-actually, the constituents combined in a compound can 'be' in a sense and yet 'not-be'. The compound may be-actually other than the constituents from which it has resulted; nevertheless each of them may still be-potentially what it was before they were combined, and both of them may survive undestroyed. (For this was the difficulty that emerged in the previous argument: and it is evident that the combining constituents not only coalesce, having formerly existed in separation, but also can again be separated out from the compound.) The constituents, therefore, neither (a) persist actually, as 'body' and 'white' persist: nor (b) are they destroyed (either one of them or both), for their 'power of action' is preserved. Hence these difficulties may be dismissed: but the problem immediately connected with them – whether combination is something relative to perception' must be set out and discussed.

When the combining constituents have been divided into parts so small, and have been juxtaposed in such a manner, that perception fails to discriminate them one from another, have they then 'been combined Or ought we to say 'No, not until any and every part of one constituent is juxtaposed to a part of the other'? The term, no doubt, is applied in the former sense: we speak, e.g. of wheat having been 'combined' with barley when each grain of the one is juxtaposed to a grain of the other. But every body is divisible and therefore, since body 'combined' with body is uniform in texture throughout, any and every part of each constituent ought to be juxtaposed to a part of the other.

No body, however, can be divided into its 'least' parts: and 'composition' is not identical with 'combination', but other than it. From these premises it clearly follows (i) that so long as the constituents are preserved in small particles, we must not speak of them as 'combined'. (For this will be a 'composition' instead of a 'blending' or 'combination': nor will every portion of the resultant exhibit the same ratio between its constituents as the whole. But we maintain that, if 'combination' has taken place, the compound must be uniform in texture throughout – any part of such a compound being the same as the whole, just as any part of water is water: whereas, if 'combination' is 'composition of the small particles', nothing of the kind will happen. On the contrary, the constituents will only be 'combined' relatively to perception: and the same thing will be 'combined' to one percipient, if his sight is not sharp, (but not to another,) while to the eye of Lynceus nothing will be 'combined'.) It clearly follows (ii) that we must not speak of the constituents as 'combined in virtue of a division such that any and every part of each is juxtaposed to a part of the other: for it is impossible for them to be thus divided. Either, then, there is no 'combination', or we have still to explain the manner in which it can take place.

Now, as we maintain, some things are such as to act and others such as to suffer action from them. Moreover, some things – viz. those which have the same matter – 'reciprocate', i.e. are such as to act upon one another and to suffer action from one another; while other things, viz. agents which have not the same matter as their patients, act without themselves suffering action. Such agents cannot 'combine' – that is why neither the art of healing nor health produces health by 'combining' with the bodies of the patients. Amongst those things, however, which are reciprocally active and passive, some are easily-divisible. Now (i) if a great quantity (or a large bulk) of one of these easily-divisible 'reciprocating' materials be brought together with a little (or with a small piece) of another, the effect produced is not 'combination', but increase of the dominant: for the other material is transformed into the dominant. (That is why a drop of wine does not 'combine' with ten thousand gallons of water: for its form is dissolved, and it is changed so as to merge in the total volume of water.) On the other hand (ii) when there is a certain equilibrium between their 'powers of action', then each of them changes out of its own nature towards the dominant: yet neither becomes the other, but both become an intermediate with properties common to both.

Thus it is clear that only those agents are 'combinable' which involve a contrariety – for these are such as to suffer action reciprocally. And, further, they combine more freely if small pieces of each of them are juxtaposed. For in that condition they change one another more easily and more quickly; whereas this effect takes a long time when agent and patient are present in bulk.

Hence, amongst the divisible susceptible materials, those whose shape is readily adaptable have a tendency to combine: for they are easily divided into small particles, since that is precisely

what ‘being readily adaptable in shape’ implies. For instance, liquids are the most ‘combinable’ of all bodies – because, of all divisible materials, the liquid is most readily adaptable in shape, unless it be viscous. Viscous liquids, it is true, produce no effect except to increase the volume and bulk. But when one of the constituents is alone susceptible – or superlatively susceptible, the other being susceptible in a very slight degree – the compound resulting from their combination is either no greater in volume or only a little greater. This is what happens when tin is combined with bronze. For some things display a hesitating and ambiguous attitude towards one another – showing a slight tendency to combine and also an inclination to behave as ‘receptive matter’ and ‘form’ respectively. The behaviour of these metals is a case in point. For the tin almost vanishes, behaving as if it were an immaterial property of the bronze: having been combined, it disappears, leaving no trace except the colour it has imparted to the bronze. The same phenomenon occurs in other instances too.

It is clear, then, from the foregoing account, that ‘combination’ occurs, what it is, to what it is due, and what kind of thing is ‘combinable’. The phenomenon depends upon the fact that some things are such as to be (a) reciprocally susceptible and (b) readily adaptable in shape, i.e. easily divisible. For such things can be ‘combined’ without its being necessary either that they should have been destroyed or that they should survive absolutely unaltered: and their ‘combination’ need not be a ‘composition’, nor merely ‘relative to perception’. On the contrary: anything is ‘combinable’ which, being readily adaptable in shape, is such as to suffer action and to act; and it is ‘combinable with’ another thing similarly characterized (for the ‘combinable’ is relative to the ‘combinable’); and ‘combination’ is unification of the ‘combinables’, resulting from their ‘alteration’.

Book II

1

We have explained under what conditions ‘combination’, ‘contact’, and ‘action-passion’ are attributable to the things which undergo natural change. Further, we have discussed ‘unqualified’ coming-to-be and passing-away, and explained under what conditions they are predicable, of what subject, and owing to what cause. Similarly, we have also discussed ‘alteration’, and explained what ‘altering’ is and how it differs from coming-to-be and passing-away. But we have still to investigate the so-called ‘elements’ of bodies.

For the complex substances whose formation and maintenance are due to natural processes all presuppose the perceptible bodies as the condition of their coming-to-be and passing-away: but philosophers disagree in regard to the matter which underlies these perceptible bodies. Some maintain it is single, supposing it to be, e.g. Air or Fire, or an ‘intermediate’ between these two (but still a body with a separate existence). Others, on the contrary, postulate two or more materials – ascribing to their ‘association’ and ‘dissociation’, or to their ‘alteration’, the coming-to-be and passing-away of things. (Some, for instance, postulate Fire and Earth: some add Air, making three: and some, like Empedocles, reckon Water as well, thus postulating four.)

Now we may agree that the primary materials, whose change (whether it be 'association and dissociation' or a process of another kind) results in coming-to-be and passing-away, are rightly described as 'originative sources, i.e. elements'. But (i) those thinkers are in error who postulate, beside the bodies we have mentioned, a single matter – and that corporeal and separable matter. For this 'body' of theirs cannot possibly exist without a 'perceptible contrariety': this 'Boundless', which some thinkers identify with the 'original real', must be either light or heavy, either cold or hot. And (ii) what Plato has written in the Timaeus is not based on any precisely-articulated conception. For he has not stated clearly whether his 'Omnirecipient' exists in separation from the 'elements'; nor does he make any use of it. He says, indeed, that it is a substratum prior to the so-called 'elements' – underlying them, as gold underlies the things that are fashioned of gold. (And yet this comparison, if thus expressed, is itself open to criticism. Things which come-to-be and pass-away cannot be called by the name of the material out of which they have come-to-be: it is only the results of 'alteration' which retain the name of the substratum whose 'alterations' they are. However, he actually says 'that the truest account is to affirm that each of them is «gold»'.) Nevertheless he carries his analysis of the 'elements' – solids though they are – back to 'planes', and it is impossible for 'the Nurse' (i.e. the primary matter) to be identical with 'the planes'.

Our own doctrine is that although there is a matter of the perceptible bodies (a matter out of which the so-called 'clements' come-to-be), it has no separate existence, but is always bound up with a contrariety. A more precise account of these presuppositions has been given in another work': we must, however, give a detailed explanation of the primary bodies as well, since they too are similarly derived from the matter. We must reckon as an 'originative source' and as 'primary' the matter which underlies, though it is inseparable

from, the contrary qualities: for the hot' is not matter for 'the cold' nor 'the cold' for 'the hot', but the substratum is matter for them both. We therefore have to recognize three 'originative sources': firstly that which potentially perceptible body, secondly the contrarieties (I mean, e.g. heat and cold), and thirdly Fire, Water, and the like. Only 'thirdly', however: for these bodies change into one another (they are not immutable as Empedocles and other thinkers assert, since 'alteration' would then have been impossible), whereas the contrarieties do not change.

Nevertheless, even so the question remains: What sorts of contrarieties, and how many of them, are to be accounted 'originative sources' of body? For all the other thinkers assume and use them without explaining why they are these or why they are just so many.

2

Since, then, we are looking for 'originative sources' of perceptible body; and since 'perceptible' is equivalent to 'tangible', and 'tangible' is that of which the perception is touch; it is clear that not all the contrarieties constitute 'forms' and 'originative sources' of body, but only those which correspond to touch. For it is in accordance with a contrariety – a contrariety, moreover, of tangible qualities – that the primary bodies are differentiated. That is why neither whiteness (and blackness), nor sweetness (and bitterness), nor (similarly) any quality belonging to the other perceptible contrarieties either, constitutes an 'element'. And yet vision is prior to touch, so that its object also is prior to the object of touch. The object of vision, however, is a quality of tangible body not qua tangible, but qua

something else – qua something which may well be naturally prior to the object of touch.

Accordingly, we must segregate the tangible differences and contrarieties, and distinguish which amongst them are primary. Contrarieties correlative to touch are the following: hot-cold, dry-moist, heavy-light, hard-soft, viscous-brittle, rough-smooth, coarse-fine. Of these (i) heavy and light are neither active nor susceptible. Things are not called 'heavy' and 'light' because they act upon, or suffer action from, other things. But the 'elements' must be reciprocally active and susceptible, since they 'combine' and are transformed into one another. On the other hand (ii) hot and cold, and dry and moist, are terms, of which the first pair implies power to act and the second pair susceptibility. 'Hot' is that which 'associates' things of the same kind (for 'dissociating', which people attribute to Fire as its function, is 'associating' things of the same class, since its effect is to eliminate what is foreign), while 'cold' is that which brings together, i.e. 'associates', homogeneous and heterogeneous things alike. And moise is that which, being readily adaptable in shape, is not determinable by any limit of its own: while 'dry' is that which is readily determinable by its own limit, but not readily adaptable in shape.

From moist and dry are derived (iii) the fine and coarse, viscous and brittle, hard and soft, and the remaining tangible differences. For (a) since the moist has no determinate shape, but is readily adaptable and follows the outline of that which is in contact with it, it is characteristic of it to be 'such as to fill up'. Now 'the fine' is 'such as to fill up'. For the fine' consists of subtle particles; but that which consists of small particles is 'such as to fill up', inasmuch as it is in contact whole with whole – and 'the fine' exhibits this character in a superlative degree. Hence it is evident that the fine derives from the moist, while the coarse derives from the dry. Again (b) the viscous'

derives from the moist: for 'the viscous' (e.g. oil) is a 'moist' modified in a certain way. 'The brittle', on the other hand, derives from the dry: for 'brittle' is that which is completely dry – so completely, that its solidification has actually been due to failure of moisture. Further (c) 'the soft' derives from the moist. For 'soft' is that which yields to pressure by retiring into itself, though it does not yield by total displacement as the moist does – which explains why the moist is not 'soft', although 'the soft' derives from the moist. 'The hard', on the other hand, derives from the dry: for 'hard' is that which is solidified, and the solidified is dry.

The terms 'dry' and 'moist' have more senses than one. For 'the damp', as well as the moist, is opposed to the dry: and again 'the solidified', as well as the dry, is opposed to the moist. But all these qualities derive from the dry and moist we mentioned first.' For (i) the dry is opposed to the damp: i.e. 'damp' is that which has foreign moisture on its surface ('sodden' being that which is penetrated to its core), while 'dry' is that which has lost foreign moisture. Hence it is evident that the damp will derive from the moist, and 'the dry' which is opposed to it will derive from the primary dry. Again (ii) the 'moist' and the solidified derive in the same way from the primary pair. For 'moist' is that which contains moisture of its own deep within it ('sodden' being that which is deeply penetrated by foreign mosture), whereas 'solidigied' is that which has lost this inner moisture. Hence these too derive from the primary pair, the 'solidified' from the dry and the 'solidified' from the dry the 'liquefiable' from the moist.

It is clear, then, that all the other differences reduce to the first four, but that these admit of no further reduction. For the hot is not essentially moist or dry, nor the moist essentially hot or cold: nor are the cold and the dry derivative forms, either of one another or of the hot and the moist. Hence these must be four.

3

The elementary qualities are four, and any four terms can be combined in six couples. Contraries, however, refuse to be coupled: for it is impossible for the same thing to be hot and cold, or moist and dry. Hence it is evident that the 'couplings' of the elementary qualities will be four: hot with dry and moist with hot, and again cold with dry and cold with moist. And these four couples have attached themselves to the apparently 'simple' bodies (Fire, Air, Water, and Earth) in a manner consonant with theory. For Fire is hot and dry, whereas Air is hot and moist (Air being a sort of aqueous vapour); and Water is cold and moist, while Earth is cold and dry. Thus the differences are reasonably distributed among the primary bodies, and the number of the latter is consonant with theory. For all who make the simple bodies 'elements' postulate either one, or two, or three, or four. Now (i) those who assert there is one only, and then generate everything else by condensation and rarefaction, are in effect making their 'originative sources' two, viz. the rare and the dense, or rather the hot and the cold: for it is these which are the moulding forces, while the 'one' underlies them as a 'matter'. But (ii) those who postulate two from the start – as Parmenides postulated Fire and Earth – make the intermediates (e.g. Air and Water) blends of these. The same course is followed (iii) by those who advocate three. (We may compare what Plato does in Me Divisions': for he makes 'the middle' a blend.) Indeed, there is practically no difference between those who postulate two and those who postulate three, except that the former split the middle 'element' into two, while the latter treat it as only one. But (iv) some advocate four from the start, e.g.

Empedocles: yet he too draws them together so as to reduce them to the two, for he opposes all the others to Fire.

In fact, however, fire and air, and each of the bodies we have mentioned, are not simple, but blended. The 'simple' bodies are indeed similar in nature to them, but not identical with them. Thus the 'simple' body corresponding to fire is 'such-as-fire, not fire: that which corresponds to air is 'such-as-air': and so on with the rest of them. But fire is an excess of heat, just as ice is an excess of cold. For freezing and boiling are excesses of heat and cold respectively. Assuming, therefore, that ice is a freezing of moist and cold, fire analogously will be a boiling of dry and hot: a fact, by the way, which explains why nothing comes-to-be either out of ice or out of fire.

The 'simple' bodies, since they are four, fall into two pairs which belong to the two regions, each to each: for Fire and Air are forms of the body moving towards the 'limit', while Earth and Water are forms of the body which moves towards the 'centre'. Fire and Earth, moreover, are extremes and purest: Water and Air, on the contrary are intermediates and more like blends. And, further, the members of either pair are contrary to those of the other, Water being contrary to Fire and Earth to Air; for the qualities constituting Water and Earth are contrary to those that constitute Fire and Air. Nevertheless, since they are four, each of them is characterized par excellence a single quality: Earth by dry rather than by cold, Water by cold rather than by moist, Air by moist rather than by hot, and Fire by hot rather than by dry.

4

It has been established before' that the coming-to-be of the 'simple' bodies is reciprocal. At the same time, it is manifest,

even on the evidence of perception, that they do come-to-be: for otherwise there would not have been 'alteration, since 'alteration' is change in respect to the qualities of the objects of touch. Consequently, we must explain (i) what is the manner of their reciprocal transformation, and (ii) whether every one of them can come-to-be out of every one – or whether some can do so, but not others.

Now it is evident that all of them are by nature such as to change into one another: for coming-to-be is a change into contraries and out of contraries, and the 'elements' all involve a contrariety in their mutual relations because their distinctive qualities are contrary. For in some of them both qualities are contrary – e.g. in Fire and Water, the first of these being dry and hot, and the second moist and cold: while in others one of the qualities (though only one) is contrary – e.g. in Air and Water, the first being moist and hot, and the second moist and cold. It is evident, therefore, if we consider them in general, that every one is by nature such as to come-to-be out of every one: and when we come to consider them severally, it is not difficult to see the manner in which their transformation is effected. For, though all will result from all, both the speed and the facility of their conversion will differ in degree.

Thus (i) the process of conversion will be quick between those which have interchangeable 'complementary factors', but slow between those which have none. The reason is that it is easier for a single thing to change than for many. Air, e.g. will result from Fire if a single quality changes: for Fire, as we saw, is hot and dry while Air is hot and moist, so that there will be Air if the dry be overcome by the moist. Again, Water will result from Air if the hot be overcome by the cold: for Air, as we saw, is hot and moist while Water is cold and moist, so that, if the hot changes, there will be Water. So too, in the same manner, Earth will result from Water and Fire from Earth, since the two

‘elements’ in both these couples have interchangeable ‘complementary factors’. For Water is moist and cold while Earth is cold and dry – so that, if the moist be overcome, there will be Earth: and again, since Fire is dry and hot while Earth is cold and dry, Fire will result from Earth if the cold pass-away.

It is evident, therefore, that the coming-to-be of the ‘simple’ bodies will be cyclical; and that this cyclical method of transformation is the easiest, because the consecutive ‘clements’ contain interchangeable ‘complementary factors’. On the other hand (ii) the transformation of Fire into Water and of Air into Earth, and again of Water and Earth into Fire and Air respectively, though possible, is more difficult because it involves the change of more qualities. For if Fire is to result from Water, both the cold and the moist must pass-away: and again, both the cold and the dry must pass-away if Air is to result from Earth. So’ too, if Water and Earth are to result from Fire and Air respectively – both qualities must change.

This second method of coming-to-be, then, takes a longer time. But (iii) if one quality in each of two ‘elements’ pass-away, the transformation, though easier, is not reciprocal. Still, from Fire plus Water there will result Earth and Air, and from Air plus Earth Fire and Water. For there will be Air, when the cold of the Water and the dry of the Fire have passed-away (since the hot of the latter and the moist of the former are left): whereas, when the hot of the Fire and the moist of the Water have passed-away, there will be Earth, owing to the survival of the dry of the Fire and the cold of the Water. So, too, in the same Way, Fire and Water will result from Air plus Earth. For there will be Water, when the hot of the Air and the dry of the Earth have passed-away (since the moist of the former and the cold of the latter are left): whereas, when the moist of the Air and the cold of the Earth have passed-away, there will be Fire, owing to the survival of the hot of the Air and the dry of the Earth – qualities

essentially constitutive of Fire. Moreover, this mode of Fire's coming-to-be is confirmed by perception. For flame is par excellence Fire: but flame is burning smoke, and smoke consists of Air and Earth.

No transformation, however, into any of the 'simple' bodies can result from the passing-away of one elementary quality in each of two 'elements' when they are taken in their consecutive order, because either identical or contrary qualities are left in the pair: but no 'simple' body can be formed either out of identical, or out of contrary, qualities. Thus no 'simple' body would result, if the dry of Fire and the moist of Air were to pass-away: for the hot is left in both. On the other hand, if the hot pass-away out both, the contraries – dry and moist – are left. A similar result will occur in all the others too: for all the consecutive 'elements' contain one identical, and one contrary, quality. Hence, too, it clearly follows that, when one of the consecutive 'elements' is transformed into one, the coming-to-be is effected by the passing-away of a single quality: whereas, when two of them are transformed into a third, more than one quality must have passedaway.

We have stated that all the 'elements' come-to-be out of any one of them; and we have explained the manner in which their mutual conversion takes place. Let us nevertheless supplement our theory by the following speculations concerning them.

5

If Water, Air, and the like are a 'matter' of which the natural bodies consist, as some thinkers in fact believe, these 'clements' must be either one, or two, or more. Now they cannot all of them be one – they cannot, e.g. all be Air or Water or Fire or

Earth – because ‘Change is into contraries’. For if they all were Air, then (assuming Air to persist) there will be ‘alteration’ instead of coming-to-be. Besides, nobody supposes a single ‘element’ to persist, as the basis of all, in such a way that it is Water as well as Air (or any other ‘element’) at the same time. So there will be a certain contrariety, i.e. a differentiating quality: and the other member of this contrariety, e.g. heat, will belong to some other ‘element’, e.g. to Fire. But Fire will certainly not be ‘hot Air’. For a change of that kind (a) is ‘alteration’, and (b) is not what is observed. Moreover (c) if Air is again to result out of the Fire, it will do so by the conversion of the hot into its contrary: this contrary, therefore, will belong to Air, and Air will be a cold something: hence it is impossible for Fire to be ‘hot Air’, since in that case the same thing will be simultaneously hot and cold. Both Fire and Air, therefore, will be something else which is the same; i.e. there will be some ‘matter’, other than either, common to both.

The same argument applies to all the ‘elements’, proving that there is no single one of them out of which they all originate. But neither is there, beside these four, some other body from which they originate – a something intermediate, e.g. between Air and Water (coarser than Air, but finer than Water), or between Air and Fire (coarser than Fire, but finer than Air). For the supposed ‘intermediate’ will be Air and Fire when a pair of contrasted qualities is added to it: but, since one of every two contrary qualities is a ‘privation’, the ‘intermediate’ never can exist – as some thinkers assert the ‘Boundless’ or the ‘Environing’ exists – in isolation. It is, therefore, equally and indifferently any one of the ‘elements’, or else it is nothing.

Since, then, there is nothing – at least, nothing perceptible – prior to these, they must be all. That being so, either they must always persist and not be transformable into one another: or they must undergo transformation – either all of them, or some

only (as Plato wrote in the Timaeus). Now it has been proved before that they must undergo reciprocal transformation. It has also been proved that the speed with which they come-to-be, one out of another, is not uniform – since the process of reciprocal transformation is relatively quick between the 'elements' with a 'complementary factor', but relatively slow between those which possess no such factor. Assuming, then, that the contrariety, in respect to which they are transformed, is one, the elements' will inevitably be two: for it is 'matter' that is the 'mean' between the two contraries, and matter is imperceptible and inseparable from them. Since, however, the 'elements' are seen to be more than two, the contrarieties must at the least be two. But the contrarieties being two, the 'elements' must be four (as they evidently are) and cannot be three: for the couplings' are four, since, though six are possible, the two in which the qualities are contrary to one another cannot occur.

These subjects have been discussed before:' but the following arguments will make it clear that, since the 'elements' are transformed into one another, it is impossible for any one of them – whether it be at the end or in the middle – to be an 'originative source' of the rest. There can be no such 'originative element' at the ends: for all of them would then be Fire or Earth, and this theory amounts to the assertion that all things are made of Fire or Earth. Nor can a 'middle-element' be such an originative source – as some thinkers suppose that Air is transformed both into Fire and into Water, and Water both into Air and into Earth, while the 'end-elements' are not further transformed into one another. For the process must come to a stop, and cannot continue ad infinitum in a straight line in either direction, since otherwise an infinite number of contrarieties would attach to the single 'element'. Let E stand for Earth, W for Water, A for Air, and F for Fire. Then (i) since A is transformed into F and W, there will be a contrariety belonging

to A F. Let these contraries be whiteness and blackness. Again (ii) since A is transformed into W, there will be another contrariety: for W is not the same as F. Let this second contrariety be dryness and moistness, D being dryness and M moistness. Now if, when A is transformed into W, the 'white' persists, Water will be moist and white: but if it does not persist, Water will be black since change is into contraries. Water, therefore, must be either white or black. Let it then be the first. On similar grounds, therefore, D (dryness) will also belong to F. Consequently F (Fire) as well as Air will be able to be transformed into Water: for it has qualities contrary to those of Water, since Fire was first taken to be black and then to be dry, while Water was moist and then showed itself white. Thus it is evident that all the 'elements' will be able to be transformed out of one another; and that, in the instances we have taken, E (Earth) also will contain the remaining two 'complementary factors', viz. the black and the moist (for these have not yet been coupled).

We have dealt with this last topic before the thesis we set out to prove. That thesis – viz. that the process cannot continue ad infinitum – will be clear from the following considerations. If Fire (which is represented by F) is not to revert, but is to be transformed in turn into some other 'element' (e.g. into Q), a new contrariety, other than those mentioned, will belong to Fire and Q: for it has been assumed that Q is not the same as any of the four, E W A and F. Let K, then, belong to F and Y to Q. Then K will belong to all four, E W A and F: for they are transformed into one another. This last point, however, we may admit, has not yet been proved: but at any rate it is clear that if Q is to be transformed in turn into yet another 'element', yet another contrariety will belong not only to Q but also to F (Fire). And, similarly, every addition of a new 'element' will carry with it the attachment of a new contrariety to the preceding elements'. Consequently, if the 'elements' are infinitely many, there will

also belong to the single 'element' an infinite number of contrarieties. But if that be so, it will be impossible to define any 'element': impossible also for any to come-to-be. For if one is to result from another, it will have to pass through such a vast number of contrarieties – and indeed even more than any determinate number. Consequently (i) into some 'elements' transformation will never be effected – viz. if the intermediates are infinite in number, as they must be if the 'elements' are infinitely many: further (ii) there will not even be a transformation of Air into Fire, if the contrarieties are infinitely many: moreover (iii) all the 'elements' become one. For all the contrarieties of the 'elements' above F must belong to those below F, and vice versa: hence they will all be one.

6

As for those who agree with Empedocles that the 'elements' of body are more than one, so that they are not transformed into one another – one may well wonder in what sense it is open to them to maintain that the 'elements' are comparable. Yet Empedocles says 'For these are all not only equal...'

If it is meant that they are comparable in their amount, all the 'comparables' must possess an identical something whereby they are measured. If, e.g. one pint of Water yields ten of Air, both are measured by the same unit; and therefore both were from the first an identical something. On the other hand, suppose (ii) they are not 'comparable in their amount' in the sense that so-much of the one yields so much of the other, but comparable in 'power of action (a pint of Water, e.g. having a power of cooling equal to that of ten pints of Air); even so, they are 'comparable in their amount', though not qua 'amount' but

qua ‘so-much power’. There is also (iii) a third possibility. Instead of comparing their powers by the measure of their amount, they might be compared as terms in a ‘correspondence’: e.g. ‘as x is hot, so correspondingly y is white’. But ‘correspondence’, though it means equality in the quantum, means similarity in a quale. Thus it is manifestly absurd that the ‘simple’ bodies, though they are not transformable, are comparable not merely as ‘corresponding’, but by a measure of their powers; i.e. that so-much Fire is comparable with many times that amount of Air, as being ‘equally’ or ‘similarly’ hot. For the same thing, if it be greater in amount, will, since it belongs to the same kind, have its ratio correspondingly increased.

A further objection to the theory of Empedocles is that it makes even growth impossible, unless it be increase by addition. For his Fire increases by Fire: ‘And Earth increases its own frame and Ether increases Ether.» These, however, are cases of addition: but it is not by addition that growing things are believed to increase. And it is far more difficult for him to account for the coming-to-be which occurs in nature. For the things which come-to-be by natural process all exhibit, in their coming-to-be, a uniformity either absolute or highly regular: while any exceptions any results which are in accordance neither with the invariable nor with the general rule are products of chance and luck. Then what is the cause determining that man comes-to-be from man, that wheat (instead of an olive) comes-to-be from wheat, either invariably or generally? Are we to say ‘Bone comes-to-be if the «elements» be put together in such-and-such a manner’? For, according to his own estatements, nothing comes-to-be from their ‘fortuitous consilience’, but only from their ‘consilience’ in a certain proportion. What, then, is the cause of this proportional consilience? Presumably not Fire or Earth. But neither is it Love and Strife: for the former is a cause of ‘association’ only, and the latter only of ‘dissociation’. No: the cause in question is the

essential nature of each thing (not merely to quote his words) 'a mingling and a divorce of what has been mingled'. And chance, not proportion, 'is the name given to these occurrences': for things can be 'mingled' fortuitously.

The cause, therefore, of the coming-to-be of the things which owe their existence to nature is that they are in such-and-such a determinate condition: and it is this which constitutes, the 'nature' of each thing – a 'nature' about which he says nothing. What he says, therefore, is no explanation of 'nature'. Moreover, it is this which is both 'the excellence' of each thing and its 'good': whereas he assigns the whole credit to the 'mingling'. (And yet the 'elements' at all events are 'dissociated' not by Strife, but by Love: since the 'elements' are by nature prior to the Deity, and they too are Deities.)

Again, his account of motion is vague. For it is not an adequate explanation to say that 'Love and Strife set things moving, unless the very nature of Love is a movement of this kind and the very nature of Strife a movement of that kind. He ought, then, either to have defined or to have postulated these characteristic movements, or to have demonstrated them – whether strictly or laxly or in some other fashion. Moreover, since (a) the 'simple' bodies appear to move 'naturally' as well as by compulsion, i.e. in a manner contrary to nature (fire, e.g. appears to move upwards without compulsion, though it appears to move by compulsion downwards); and since (b) what is 'natural' is contrary to that which is due to compulsion, and movement by compulsion actually occurs; it follows that 'natural movement' can also occur in fact. Is this, then, the movement that Love sets going? No: for, on the contrary, the 'natural movement' moves Earth downwards and resembles 'dissociation', and Strife rather than Love is its cause – so that in general, too, Love rather than Strife would seem to be contrary to nature. And unless Love or Strife is actually setting them in

motion, the 'simple' bodies themselves have absolutely no movement or rest. But this is paradoxical: and what is more, they do in fact obviously move. For though Strife 'dissociated', it was not by Strife that the 'Ether' was borne upwards. On the contrary, sometimes he attributes its movement to something like chance ('For thus, as it ran, it happened to meet them then, though often otherwise»), while at other times he says it is the nature of Fire to be borne upwards, but 'the Ether' (to quote his words) 'sank down upon the Earth with long roots'. With such statements, too, he combines the assertion that the Order of the World is the same now, in the reign of Strife, as it was formerly in the reign of Love. What, then, is the 'first mover' of the 'elements'? What causes their motion? Presumably not Love and Strife: on the contrary, these are causes of a particular motion, if at least we assume that 'first mover' to be an originative source'.

An additional paradox is that the soul should consist of the 'elements', or that it should be one of them. How are the soul's 'alterations' to take Place? How, e.g. is the change from being musical to being unmusical, or how is memory or forgetting, to occur? For clearly, if the soul be Fire, only such modifications will happen to it as characterize Fire qua Fire: while if it be compounded out of the elements', only the corporeal modifications will occur in it. But the changes we have mentioned are none of them corporeal.

7

The discussion of these difficulties, however, is a task appropriate to a different investigation:' let us return to the 'elements' of which bodies are composed. The theories that

‘there is something common to all the «elements», and that they are reciprocally transformed’, are so related that those who accept either are bound to accept the other as well. Those, on the other hand, who do not make their coming-to-be reciprocal – who refuse to suppose that any one of the ‘elements’ comes-to-be out of any other taken singly, except in the sense in which bricks come-to-be out of a wall – are faced with a paradox. How, on their theory, are flesh and bones or any of the other compounds to result from the ‘elements’ taken together?

Indeed, the point we have raised constitutes a problem even for those who generate the ‘elements’ out of one another. In what manner does anything other than, and beside, the ‘elements’ come-to-be out of them? Let me illustrate my meaning. Water can come-to-be out of Fire and Fire out of Water; for their substralum is something common to them both. But flesh too, presumably, and marrow come-to-be out of them. How, then, do such things come-to-be? For (a) how is the manner of their coming-to-be to be conceived by those who maintain a theory like that of Empedocles? They must conceive it as composition – just as a wall comes-to-be out of bricks and stones: and the ‘Mixture’, of which they speak, will be composed of the ‘elements’, these being preserved in it unaltered but with their small particles juxtaposed each to each. That will be the manner, presumably, in which flesh and every other compound results from the ‘elements’. Consequently, it follows that Fire and Water do not come-to-be ‘out of any and every part of flesh’. For instance, although a sphere might come-to-be out of this part of a lump of wax and a pyramid out of some other part, it was nevertheless possible for either figure to have come-to-be out of either part indifferently: that is the manner of coming-to-be when ‘both Fire and Water come-to-be out of any and every part of flesh’. Those, however, who maintain the theory in question, are not at liberty to conceive that ‘both come-to-be out of flesh’ in that manner, but only as a stone and

a brick 'both come-to-be out of a wall' – viz. each out of a different place or part. Similarly (b) even for those who postulate a single matter of their 'elements' there is a certain difficulty in explaining how anything is to result from two of them taken together – e.g. from 'cold' and hot', or from Fire and Earth. For if flesh consists of both and is neither of them, nor again is a 'composition' of them in which they are preserved unaltered, what alternative is left except to identify the resultant of the two 'elements' with their matter? For the passing-away of either 'element' produces either the other or the matter.

Perhaps we may suggest the following solution. (i) There are differences of degree in hot and cold. Although, therefore, when either is fully real without qualification, the other will exist potentially; yet, when neither exists in the full completeness of its being, but both by combining destroy one another's excesses so that there exist instead a hot which (for a 'hot') is cold and a cold which (for a 'cold') is hot; then what results from these two contraries will be neither their matter, nor either of them existing in its full reality without qualification. There will result instead an 'intermediate': and this 'intermediate', according as it is potentially more hot than cold or vice versa, will possess a power-of-heating that is double or triple its power-of-cooling, or otherwise related thereto in some similar ratio. Thus all the other bodies will result from the contraries, or rather from the 'elements', in so far as these have been 'combined': while the elements' will result from the contraries, in so far as these 'exist potentially' in a special sense – not as matter 'exists potentially', but in the sense explained above. And when a thing comes-to-be in this manner, the process is cobination'; whereas what comes-to-be in the other manner is matter. Moreover (ii) contraries also 'suffer action', in accordance with the disjunctively-articulated definition established in the early part of this work.' For the actually-hot is potentially-cold and the

actually cold potentially-hot; so that hot and cold, unless they are equally balanced, are transformed into one another (and all the other contraries behave in a similar way). It is thus, then, that in the first place the 'elements' are transformed; and that (in the second place) out of the 'elements' there come-to-be flesh and bones and the like – the hot becoming cold and the cold becoming hot when they have been brought to the 'mean'. For at the 'mean' is neither hot nor cold. The 'mean', however, is of considerable extent and not indivisible. Similarly, it is qua reduced to a 'mean' condition that the dry and the moist, as well as the contraries we have used as examples, produce flesh and bone and the remaining compounds.

8

All the compound bodies – all of which exist in the region belonging to the central body – are composed of all the 'simple' bodies. For they all contain Earth because every 'simple' body is to be found specially and most abundantly in its own place. And they all contain Water because (a) the compound must possess a definite outline and Water, alone of the 'simple' bodies, is readily adaptable in shape: moreover (b) Earth has no power of cohesion without the moist. On the contrary, the moist is what holds it together; for it would fall to pieces if the moist were eliminated from it completely.

They contain Earth and Water, then, for the reasons we have given: and they contain Air and Fire, because these are contrary to Earth and Water (Earth being contrary to Air and Water to Fire, in so far as one Substance can be 'contrary' to another). Now all compounds presuppose in their coming-to-be constituents which are contrary to one another: and in all

compounds there is contained one set of the contrasted extremes. Hence the other set must be contained in them also, so that every compound will include all the ‘simple’ bodies.

Additional evidence seems to be furnished by the food each compound takes. For all of them are fed by substances which are the same as their constituents, and all of them are fed by more substances than one. Indeed, even the plants, though it might be thought they are fed by one substance only, viz. by Water, are fed by more than one: for Earth has been mixed with the Water. That is why farmers too endeavour to mix before watering. Although food is akin to the matter, that which is fed is the ‘figure’ – i.e. the ‘form’ taken along with the matter. This fact enables us to understand why, whereas all the ‘simple’ bodies come-to-be out of one another, Fire is the only one of them which (as our predecessors also assert) ‘is fed’. For Fire alone – or more than all the rest – is akin to the ‘form’ because it tends by nature to be borne towards the limit. Now each of them naturally tends to be borne towards its own place; but the ‘figure’ – i.e. the ‘form’ – of them all is at the limits.

Thus we have explained that all the compound bodies are composed of all the ‘simple’ bodies.

9

Since some things are such as to come-to-be and pass-away, and since coming-to-be in fact occurs in the region about the centre, we must explain the number and the nature of the ‘originative sources’ of all coming-to-be alike: for a grasp of the true theory of any universal facilitates the understanding of its specific forms.

The ‘originative sources’, then, of the things which come-to-be are equal in number to, and identical in kind with, those in the sphere of the eternal and primary things. For there is one in the sense of ‘matter’, and a second in the sense of ‘form’: and, in addition, the third ‘originative source’ must be present as well. For the two first are not sufficient to bring things into being, any more than they are adequate to account for the primary things.

Now cause, in the sense of material origin, for the things which are such as to come-to-be is ‘that which can be-and-not-be’: and this is identical with ‘that which can come-to-be-and-pass-away’, since the latter, while it is at one time, at another time is not. (For whereas some things are of necessity, viz. the eternal things, others of necessity are not. And of these two sets of things, since they cannot diverge from the necessity of their nature, it is impossible for the first not to he and impossible for the second to he. Other things, however, can both be and not he.) Hence coming-to-be and passing-away must occur within the field of ‘that which can be-and-not-be’. This, therefore, is cause in the sense of material origin for the things which are such as to come-to-be; while cause, in the sense of their ‘end’, is their ‘figure’ or ‘form’ – and that is the formula expressing the essential nature of each of them.

But the third ‘originative source’ must be present as well – the cause vaguely dreamed of by all our predecessors, definitely stated by none of them. On the contrary (a) some amongst them thought the nature of ‘the Forms’ was adequate to account for coming-to-be. Thus Socrates in the Phaedo first blames everybody else for having given no explanation; and then lays it down; that ‘some things are Forms, others Participants in the Forms’, and that ‘while a thing is said to «be» in virtue of the Form, it is said to «come-to-be» qua sharing in,» to «pass-away» qua «losing,» the ‘Form’. Hence he thinks that ‘assuming the truth of these theses, the Forms must be causes both of coming-

to-be and of passing-away'. On the other hand (b) there were others who thought 'the matter' was adequate by itself to account for coming-to-be, since 'the movement originates from the matter'.

Neither of these theories, however, is sound. For (a) if the Forms are causes, why is their generating activity intermittent instead of perpetual and continuous – since there always are Participants as well as Forms? Besides, in some instances we see that the cause is other than the Form. For it is the doctor who implants health and the man of science who implants science, although 'Health itself' and 'Science itself' are as well as the Participants: and the same principle applies to everything else that is produced in accordance with an art. On the other hand (b) to say that 'matter generates owing to its movement' would be, no doubt, more scientific than to make such statements as are made by the thinkers we have been criticizing. For what 'alters' and transfigures plays a greater part in bringing, things into being; and we are everywhere accustomed, in the products of nature and of art alike, to look upon that which can initiate movement as the producing cause. Nevertheless this second theory is not right either.

For, to begin with, it is characteristic of matter to suffer action, i.e. to be moved: but to move, i.e. to act, belongs to a different 'power'. This is obvious both in the things that come-to-be by art and in those that come-to-be by nature. Water does not of itself produce out of itself an animal: and it is the art, not the wood, that makes a bed. Nor is this their only error. They make a second mistake in omitting the more controlling cause: for they eliminate the essential nature, i.e. the 'form'. And what is more, since they remove the formal cause, they invest the forces they assign to the 'simple' bodies – the forces which enable these bodies to bring things into being – with too instrumental a character. For 'since' (as they say) 'it is the nature of the hot to

dissociate, of the cold to bring together, and of each remaining contrary either to act or to suffer action', it is out of such materials and by their agency (so they maintain) that everything else comes-to-be and passes-away. Yet (a) it is evident that even Fire is itself moved, i.e. suffers action. Moreover (b) their procedure is virtually the same as if one were to treat the saw (and the various instruments of carpentry) as 'the cause' of the things that come-to-be: for the wood must be divided if a man saws, must become smooth if he planes, and so on with the remaining tools. Hence, however true it may be that Fire is active, i.e. sets things moving, there is a further point they fail to observe – viz. that Fire is inferior to the tools or instruments in the manner in which it sets things moving.

10

As to our own theory – we have given a general account of the causes in an earlier work – we have now explained and distinguished the 'matter' and the 'form'. Further, since the change which is motion has been proved' to be eternal, the continuity of the occurrence of coming-to-be follows necessarily from what we have established: for the eternal motion, by causing 'the generator' to approach and retire, will produce coming-to-be uninterruptedly. At the same time it is clear that we were right when, in an earlier work,' we called motion (not coming-to-be) 'the primary form of change'. For it is far more reasonable that what is should cause the coming-to-be of what is not, than that what is not should cause the being of what is. Now that which is being moved is, but that which is coming-to-be is not: hence, also, motion is prior to coming-to-be.

We have assumed, and have proved, that coming-to-be and passing-away happen to things continuously; and we assert that motion causes coming-to-be. That being so, it is evident that, if the motion be single, both processes cannot occur since they are contrary to one another: for it is a law of nature that the same cause, provided it remain in the same condition, always produces the same effect, so that, from a single motion, either coming-to-be or passing-away will always result. The movements must, on the contrary, be more than one, and they must be contrasted with one another either by the sense of their motion or by its irregularity: for contrary effects demand contraries as their causes.

This explains why it is not the primary motion that causes coming-to-be and passing-away, but the motion along the inclined circle: for this motion not only possesses the necessary continuity, but includes a duality of movements as well. For if coming-to-be and passing-away are always to be continuous, there must be some body always being moved (in order that these changes may not fail) and moved with a duality of movements (in order that both changes, not one only, may result). Now the continuity of this movement is caused by the motion of the whole: but the approaching and retreating of the moving body are caused by the inclination. For the consequence of the inclination is that the body becomes alternately remote and near; and since its distance is thus unequal, its movement will be irregular. Therefore, if it generates by approaching and by its proximity, it – this very same body – destroys by retreating and becoming remote: and if it generates by many successive approaches, it also destroys by many successive retirements. For contrary effects demand contraries as their causes; and the natural processes of passing-away and coming-to-be occupy equal periods of time. Hence, too, the times – i.e. the lives – of the several kinds of living things have a number by which they are distinguished: for there is an Order controlling all things,

and every time (i.e. every life) is measured by a period. Not all of them, however, are measured by the same period, but some by a smaller and others by a greater one: for to some of them the period, which is their measure, is a year, while to some it is longer and to others shorter.

And there are facts of observation in manifest agreement with our theories. Thus we see that coming-to-be occurs as the sun approaches and decay as it retreats; and we see that the two processes occupy equal times. For the durations of the natural processes of passing-away and coming-to-be are equal. Nevertheless it Often happens that things pass-away in too short a time. This is due to the 'intermingling' by which the things that come-to-be and pass-away are implicated with one another. For their matter is 'irregular', i.e. is not everywhere the same: hence the processes by which they come-to-be must be 'irregular' too, i.e. some too quick and others too slow. Consequently the phenomenon in question occurs, because the 'irregular' coming-to-be of these things is the passing-away of other things.

Coming-to-be and passing-away will, as we have said, always be continuous, and will never fail owing to the cause we stated. And this continuity has a sufficient reason on our theory. For in all things, as we affirm, Nature always strives after 'the better'. Now 'being' (we have explained elsewhere the exact variety of meanings we recognize in this term) is better than 'not-being': but not all things can possess 'being', since they are too far removed from the 'originative source. 'God therefore adopted the remaining alternative, and fulfilled the perfection of the universe by making coming-to-be uninterrupted: for the greatest possible coherence would thus be secured to existence, because that 'coming-to-be should itself come-to-be perpetually' is the closest approximation to eternal being.

The cause of this perpetuity of coming-to-be, as we have often said, is circular motion: for that is the only motion which is continuous. That, too, is why all the other things – the things, I mean, which are reciprocally transformed in virtue of their 'passions' and their 'powers of action' e.g. the 'simple' bodiesimitate circular motion. For when Water is transformed into Air, Air into Fire, and the Fire back into Water, we say the coming-to-be 'has completed the circle', because it reverts again to the beginning. Hence it is by imitating circular motion that rectilinear motion too is continuous.

These considerations serve at the same time to explain what is to some people a baffling problem – viz. why the 'simple' bodies, since each them is travelling towards its own place, have not become dissevered from one another in the infinite lapse of time. The reason is their reciprocal transformation. For, had each of them persisted in its own place instead of being transformed by its neighbour, they would have got dissevered long ago. They are transformed, however, owing to the motion with its dual character: and because they are transformed, none of them is able to persist in any place allotted to it by the Order.

It is clear from what has been said (i) that coming-to-be and passing-away actually occur, (ii) what causes them, and (iii) what subject undergoes them. But (a) if there is to be movement (as we have explained elsewhere, in an earlier work') there must be something which initiates it; if there is to be movement always, there must always be something which initiates it; if the movement is to be continuous, what initiates it must be single, unmoved, ungenerated, and incapable of 'alteration'; and if the circular movements are more than one, their initiating causes must all of them, in spite of their plurality, be in some way subordinated to a single 'originative source'. Further (b) since time is continuous, movement must be continuous, inasmuch as there can be no time without movement. Time, therefore, is a

‘number’ of some continuous movement – a ‘number’, therefore, of the circular movement, as was established in the discussions at the beginning. But (c) is movement continuous because of the continuity of that which is moved, or because that in which the movement occurs (I mean, e.g. the place or the quality) is continuous? The answer must clearly be ‘because that which is moved is continuous’. (For how can the quality be continuous except in virtue of the continuity of the thing to which it belongs? But if the continuity of ‘that in which’ contributes to make the movement continuous, this is true only of ‘the place in which’; for that has ‘magnitude’ in a sense.) But (d) amongst continuous bodies which are moved, only that which is moved in a circle is ‘continuous’ in such a way that it preserves its continuity with itself throughout the movement. The conclusion therefore is that this is what produces continuous movement, viz. the body which is being moved in a circle; and its movement makes time continuous.

11

Wherever there is continuity in any process (coming-to-be or ‘alteration’ or any kind of change whatever) we observe consecutiveness’, i.e. this coming-to-be after that without any interval. Hence we must investigate whether, amongst the consecutive members, there is any whose future being is necessary; or whether, on the contrary, every one of them may fail to come-to-be. For that some of them may fail to occur, is clear. (a) We need only appeal to the distinction between the statements ‘x will be’ and ‘x is about to which depends upon this fact. For if it be true to say of x that it ‘will be’, it must at some time be true to say of it that ‘it is’: whereas, though it be true to say of x now that ‘it is about to occur’, it is quite possible

for it not to come-to-be – thus a man might not walk, though he is now 'about to' walk. And (b) since (to appeal to a general principle) amongst the things which 'are' some are capable also of 'not-being', it is clear that the same ambiguous character will attach to them no less when they are coming-to-be: in other words, their coming-to-be will not be necessary.

Then are all the things that come-to-be of this contingent character? Or, on the contrary, is it absolutely necessary for some of them to come-to-be? Is there, in fact, a distinction in the field of 'coming-to-be' corresponding to the distinction, within the field of 'being', between things that cannot possibly 'not-be' and things that can 'not-be'? For instance, is it necessary that solstices shall come-to-be, i.e. impossible that they should fail to be able to occur?

Assuming that the antecedent must have come-to-be if the consequent is to be (e.g. that foundations must have come-to-be if there is to be a house: clay, if there are to be foundations), is the converse also true? If foundations have come-to-be, must a house come-to-be? The answer seems to be that the necessary nexus no longer holds, unless it is 'necessary' for the consequent (as well as for the antecedent) to come-to-be – 'necessary' absolutely. If that be the case, however, 'a house must come-to-be if foundations have come-to-be', as well as vice versa. For the antecedent was assumed to be so related to the consequent that, if the latter is to be, the antecedent must have come-to-be before it. If, therefore, it is necessary that the consequent should come-to-be, the antecedent also must have come-to-be: and if the antecedent has come-to-be, then the consequent also must come-to-be – not, however, because of the antecedent, but because the future being of the consequent was assumed as necessary. Hence, in any sequence, when the being of the consequent is necessary, the nexus is reciprocal –

in other words, when the antecedent has come-to-be the consequent must always come-to-be too.

Now (i) if the sequence of occurrences is to proceed ad infinitum 'downwards', the coming-to-be of any determinate 'this' amongst the later members of the sequence will not be absolutely, but only conditionally, necessary. For it will always be necessary that some other member shall have come-to-be before 'this' as the presupposed condition of the necessity that 'this' should come-to-be: consequently, since what is 'infinite' has no 'originative source', neither will there be in the infinite sequence any 'primary' member which will make it 'necessary' for the remaining members to come-to-be.

Nor again (ii) will it be possible to say with truth, even in regard to the members of a limited sequence, that it is 'absolutely necessary' for any one of them to come-to-be. We cannot truly say, e.g. that 'it is absolutely necessary for a house to come-to-be when foundations have been laid': for (unless it is always necessary for a house to be coming-to-be) we should be faced with the consequence that, when foundations have been laid, a thing, which need not always be, must always be. No: if its coming-to-be is to be 'necessary', it must be 'always' in its coming-to-be. For what is 'of necessity' coincides with what is 'always', since that which 'must be' cannot possibly 'not-be'. Hence a thing is eternal if its 'being' is necessary: and if it is eternal, its 'being' is necessary. And if, therefore, the 'coming-to-be' of a thing is necessary, its 'coming-to-be' is eternal; and if eternal, necessary.

It follows that the coming-to-be of anything, if it is absolutely necessary, must be cyclical – i.e. must return upon itself. For coming-to-be must either be limited or not limited: and if not limited, it must be either rectilinear or cyclical. But the first of these last two alternatives is impossible if coming-to-be is to be

eternal, because there could not be any 'originative source' whatever in an infinite rectilinear sequence, whether its members be taken 'downwards' (as future events) or 'upwards' (as past events). Yet coming-to-be must have an 'originative source' (if it is to be necessary and therefore eternal), nor can it be eternal if it is limited. Consequently it must be cyclical. Hence the nexus must be reciprocal. By this I mean that the necessary occurrence of 'this' involves the necessary occurrence of its antecedent: and conversely that, given the antecedent, it is also necessary for the consequent to come-to-be. And this reciprocal nexus will hold continuously throughout the sequence: for it makes no difference whether the reciprocal nexus, of which we are speaking, is mediated by two, or by many, members.

It is in circular movement, therefore, and in cyclical coming-to-be that the 'absolutely necessary' is to be found. In other words, if the coming-to-be of any things is cyclical, it is 'necessary' that each of them is coming-to-be and has come-to-be: and if the coming-to-be of any things is 'necessary', their coming-to-be is cyclical.

The result we have reached is logically concordant with the eternity of circular motion, i.e. the eternity of the revolution of the heavens (a fact which approved itself on other and independent evidence),' since precisely those movements which belong to, and depend upon, this eternal revolution 'come-to-be' of necessity, and of necessity 'will be'. For since the revolving body is always setting something else in motion, the movement of the things it moves must also be circular. Thus, from the being of the 'upper revolution' it follows that the sun revolves in this determinate manner; and since the sun revolves thus, the seasons in consequence come-to-be in a cycle, i.e. return upon themselves; and since they come-to-be cyclically, so in their turn do the things whose coming-to-be the seasons initiate.

Then why do some things manifestly come-to-be in this cyclical fashion (as, e.g. showers and air, so that it must rain if there is to be a cloud and, conversely, there must be a cloud if it is to rain), while men and animals do not 'return upon themselves' so that the same individual comes-to-be a second time (for though your coming-to-be presupposes your father's, his coming-to-be does not presuppose yours)? Why, on the contrary, does this coming-to-be seem to constitute a rectilinear sequence?

In discussing this new problem, we must begin by inquiring whether all things 'return upon themselves' in a uniform manner; or whether, on the contrary, though in some sequences what recurs is numerically the same, in other sequences it is the same only in species. In consequence of this distinction, it is evident that those things, whose 'substance' – that which is undergoing the process – is imperishable, will be numerically, as well as specifically, the same in their recurrence: for the character of the process is determined by the character of that which undergoes it. Those things, on the other hand, whose 'substance' is perish, able (not imperishable) must 'return upon themselves' in the sense that what recurs, though specifically the same, is not the same numerically. That why, when Water comes-to-be from Air and Air from Water, the Air is the same 'specifically', not 'numerically': and if these too recur numerically the same, at any rate this does not happen with things whose 'substance' comes-to-be – whose 'substance' is such that it is essentially capable of not-being.

Aristotle – Meteorology

[Translated by E. W. Webster]

Book I

1

We have already discussed the first causes of nature, and all natural motion, also the stars ordered in the motion of the heavens, and the physical element – enumerating and specifying them and showing how they change into one another – and becoming and perishing in general. There remains for consideration a part of this inquiry which all our predecessors called meteorology. It is concerned with events that are natural, though their order is less perfect than that of the first of the elements of bodies. They take place in the region nearest to the motion of the stars. Such are the milky way, and comets, and the movements of meteors. It studies also all the affections we may call common to air and water, and the kinds and parts of the earth and the affections of its parts. These throw light on the causes of winds and earthquakes and all the consequences the motions of these kinds and parts involve. Of these things some puzzle us, while others admit of explanation in some degree. Further, the inquiry is concerned with the falling of thunderbolts and with whirlwinds and fire-winds, and further, the recurrent affections produced in these same bodies by concretion. When the inquiry into these matters is concluded let us consider what account we can give, in accordance with the method we have followed, of animals and plants, both generally and in detail. When that has been done we may say

that the whole of our original undertaking will have been carried out.

After this introduction let us begin by discussing our immediate subject.

2

We have already laid down that there is one physical element which makes up the system of the bodies that move in a circle, and besides this four bodies owing their existence to the four principles, the motion of these latter bodies being of two kinds: either from the centre or to the centre. These four bodies are fire, air, water, earth. Fire occupies the highest place among them all, earth the lowest, and two elements correspond to these in their relation to one another, air being nearest to fire, water to earth. The whole world surrounding the earth, then, the affections of which are our subject, is made up of these bodies. This world necessarily has a certain continuity with the upper motions: consequently all its power and order is derived from them. (For the originating principle of all motion is the first cause. Besides, that clement is eternal and its motion has no limit in space, but is always complete; whereas all these other bodies have separate regions which limit one another.) So we must treat fire and earth and the elements like them as the material causes of the events in this world (meaning by material what is subject and is affected), but must assign causality in the sense of the originating principle of motion to the influence of the eternally moving bodies.

3

Let us first recall our original principles and the distinctions already drawn and then explain the 'milky way' and comets and the other phenomena akin to these.

Fire, air, water, earth, we assert, originate from one another, and each of them exists potentially in each, as all things do that can be resolved into a common and ultimate substrate.

The first difficulty is raised by what is called the air. What are we to take its nature to be in the world surrounding the earth? And what is its position relatively to the other physical elements. (For there is no question as to the relation of the bulk of the earth to the size of the bodies which exist around it, since astronomical demonstrations have by this time proved to us that it is actually far smaller than some individual stars. As for the water, it is not observed to exist collectively and separately, nor can it do so apart from that volume of it which has its seat about the earth: the sea, that is, and rivers, which we can see, and any subterranean water that may be hidden from our observation.) The question is really about that which lies between the earth and the nearest stars. Are we to consider it to be one kind of body or more than one? And if more than one, how many are there and what are the bounds of their regions?

We have already described and characterized the first element, and explained that the whole world of the upper motions is full of that body.

This is an opinion we are not alone in holding: it appears to be an old assumption and one which men have held in the past, for the word ether has long been used to denote that element. Anaxagoras, it is true, seems to me to think that the word means the same as fire. For he thought that the upper regions were full of fire, and that men referred to those regions when

they spoke of ether. In the latter point he was right, for men seem to have assumed that a body that was eternally in motion was also divine in nature; and, as such a body was different from any of the terrestrial elements, they determined to call it ‘ether’.

For the um opinions appear in cycles among men not once nor twice, but infinitely often.

Now there are some who maintain that not only the bodies in motion but that which contains them is pure fire, and the interval between the earth and the stars air: but if they had considered what is now satisfactorily established by mathematics, they might have given up this puerile opinion. For it is altogether childish to suppose that the moving bodies are all of them of a small size, because they so to us, looking at them from the earth.

This a matter which we have already discussed in our treatment of the upper region, but we may return to the point now.

If the intervals were full of fire and the bodies consisted of fire every one of the other elements would long ago have vanished.

However, they cannot simply be said to be full of air either; for even if there were two elements to fill the space between the earth and the heavens, the air would far exceed the quantitu required to maintain its proper proportion to the other elements. For the bulk of the earth (which includes the whole volume of water) is infinitesimal in comparison with the whole world that surrounds it. Now we find that the excess in volume is not proportionately great where water dissolves into air or air into fire. Whereas the proportion between any given small quantity of water and the air that is generated from it ought to hold good between the total amount of air and the total amount

of water. Nor does it make any difference if any one denies that the elements originate from one another, but asserts that they are equal in power. For on this view it is certain amounts of each that are equal in power, just as would be the case if they actually originated from one another.

So it is clear that neither air nor fire alone fills the intermediate space.

It remains to explain, after a preliminary discussion of difficulties, the relation of the two elements air and fire to the position of the first element, and the reason why the stars in the upper region impart heat to the earth and its neighbourhood. Let us first treat of the air, as we proposed, and then go on to these questions.

Since water is generated from air, and air from water, why are clouds not formed in the upper air? They ought to form there the more, the further from the earth and the colder that region is. For it is neither appreciably near to the heat of the stars, nor to the rays relected from the earth. It is these that dissolve any formation by their heat and so prevent clouds from forming near the earth. For clouds gather at the point where the reflected rays disperse in the infinity of space and are lost. To explain this we must suppose either that it is not all air which water is generated, or, if it is produced from all air alike, that what immediately surrounds the earth is not mere air, but a sort of vapour, and that its vaporous nature is the reason why it condenses back to water again. But if the whole of that vast region is vapour, the amount of air and of water will be disproportionately great. For the spaces left by the heavenly bodies must be filled by some element. This cannot be fire, for then all the rest would have been dried up. Consequently, what fills it must be air and the water that surrounds the whole earth-vapour being water dissolved.

After this exposition of the difficulties involved, let us go on to lay down the truth, with a view at once to what follows and to what has already been said. The upper region as far as the moon we affirm to consist of a body distinct both from fire and from air, but varying degree of purity and in kind, especially towards its limit on the side of the air, and of the world surrounding the earth. Now the circular motion of the first element and of the bodies it contains dissolves, and inflames by its motion, whatever part of the lower world is nearest to it, and so generates heat. From another point of view we may look at the motion as follows. The body that lies below the circular motion of the heavens is, in a sort, matter, and is potentially hot, cold, dry, moist, and possessed of whatever other qualities are derived from these. But it actually acquires or retains one of these in virtue of motion or rest, the cause and principle of which has already been explained. So at the centre and round it we get earth and water, the heaviest and coldest elements, by themselves; round them and contiguous with them, air and what we commonly call fire. It is not really fire, for fire is an excess of heat and a sort of ebullition; but in reality, of what we call air, the part surrounding the earth is moist and warm, because it contains both vapour and a dry exhalation from the earth. But the next part, above that, is warm and dry. For vapour is naturally moist and cold, but the exhalation warm and dry; and vapour is potentially like water, the exhalation potentially like fire. So we must take the reason why clouds are not formed in the upper region to be this: that it is filled not with mere air but rather with a sort of fire.

However, it may well be that the formation of clouds in that upper region is also prevented by the circular motion. For the air round the earth is necessarily all of it in motion, except that which is cut off inside the circumference which makes the earth a complete sphere. In the case of winds it is actually observable that they originate in marshy districts of the earth;

and they do not seem to blow above the level of the highest mountains. It is the revolution of the heaven which carries the air with it and causes its circular motion, fire being continuous with the upper element and air with fire. Thus its motion is a second reason why that air is not condensed into water.

But whenever a particle of air grows heavy, the warmth in it is squeezed out into the upper region and it sinks, and other particles in turn are carried up together with the fiery exhalation. Thus the one region is always full of air and the other of fire, and each of them is perpetually in a state of change.

So much to explain why clouds are not formed and why the air is not condensed into water, and what account must be given of the space between the stars and the earth, and what is the body that fills it.

As for the heat derived from the sun, the right place for a special and scientific account of it is in the treatise about sense, since heat is an affection of sense, but we may now explain how it can be produced by the heavenly bodies which are not themselves hot.

We see that motion is able to dissolve and inflame the air; indeed, moving bodies are often actually found to melt. Now the sun's motion alone is sufficient to account for the origin of terrestrial warmth and heat. For a motion that is to have this effect must be rapid and near, and that of the stars is rapid but distant, while that of the moon is near but slow, whereas the sun's motion combines both conditions in a sufficient degree. That most heat should be generated where the sun is present is easy to understand if we consider the analogy of terrestrial phenomena, for here, too, it is the air that is nearest to a thing in rapid motion which is heated most. This is just what we

should expect, as it is the nearest air that is most dissolved by the motion of a solid body.

This then is one reason why heat reaches our world. Another is that the fire surrounding the air is often scattered by the motion of the heavens and driven downwards in spite of itself.

Shooting-stars further suffix to prove that the celestial sphere is not hot or fiery: for they do not occur in that upper region but below: yet the more and the faster a thing moves, the more apt it is to take fire. Besides, the sun, which most of all the stars is considered to be hot, is really white and not fiery in colour.

4

Having determined these principles let us explain the cause of the appearance in the sky of burning flames and of shooting-stars, and of 'torches', and 'goats', as some people call them. All these phenomena are one and the same thing, and are due to the same cause, the difference between them being one of degree.

The explanation of these and many other phenomena is this. When the sun warms the earth the evaporation which takes place is necessarily of two kinds, not of one only as some think. One kind is rather of the nature of vapour, the other of the nature of a windy exhalation. That which rises from the moisture contained in the earth and on its surface is vapour, while that rising from the earth itself, which is dry, is like smoke. Of these the windy exhalation, being warm, rises above the moister vapour, which is heavy and sinks below the other. Hence the world surrounding the earth is ordered as follows. First below the circular motion comes the warm and dry

element, which we call fire, for there is no word fully adequate to every state of the fumid evaporation: but we must use this terminology since this element is the most inflammable of all bodies. Below this comes air. We must think of what we just called fire as being spread round the terrestrial sphere on the outside like a kind of fuel, so that a little motion often makes it burst into flame just as smoke does: for flame is the ebullition of a dry exhalation. So whenever the circular motion stirs this stuff up in any way, it catches fire at the point at which it is most inflammable. The result differs according to the disposition and quantity of the combustible material. If this is broad and long, we often see a flame burning as in a field of stubble: if it burns lengthwise only, we see what are called 'torches' and 'goats' and shooting-stars. Now when the inflammable material is longer than it is broad sometimes it seems to throw off sparks as it burns. (This happens because matter catches fire at the sides in small portions but continuously with the main body.) Then it is called a 'goat'. When this does not happen it is a 'torch'. But if the whole length of the exhalation is scattered in small parts and in many directions and in breadth and depth alike, we get what are called shooting-stars.

The cause of these shooting-stars is sometimes the motion which ignites the exhalation. At other times the air is condensed by cold and squeezes out and ejects the hot element; making their motion look more like that of a thing thrown than like a running fire. For the question might be raised whether the 'shooting' of a 'star' is the same thing as when you put an exhalation below a lamp and it lights the lower lamp from the flame above. For here too the flame passes wonderfully quickly and looks like a thing thrown, and not as if one thing after another caught fire. Or is a 'star' when it 'shoots' a single body that is thrown? Apparently both cases occur: sometimes it is like the flame from the lamp and sometimes bodies are

projected by being squeezed out (like fruit stones from one's fingers) and so are seen to fall into the sea and on the dry land, both by night and by day when the sky is clear. They are thrown downwards because the condensation which propels them inclines downwards. Thunderbolts fall downwards for the same reason: their origin is never combustion but ejection under pressure, since naturally all heat tends upwards.

When the phenomenon is formed in the upper region it is due to the combustion of the exhalation. When it takes place at a lower level it is due to the ejection of the exhalation by the condensing and cooling of the moister evaporation: for this latter as it condenses and inclines downward contracts, and thrusts out the hot element and causes it to be thrown downwards. The motion is upwards or downwards or sideways according to the way in which the evaporation lies, and its disposition in respect of breadth and depth. In most cases the direction is sideways because two motions are involved, a compulsory motion downwards and a natural motion upwards, and under these circumstances an object always moves obliquely. Hence the motion of 'shooting-stars' is generally oblique.

So the material cause of all these phenomena is the exhalation, the efficient cause sometimes the upper motion, sometimes the contraction and condensation of the air. Further, all these things happen below the moon. This is shown by their apparent speed, which is equal to that of things thrown by us; for it is because they are close to us, that these latter seem far to exceed in speed the stars, the sun, and the moon.

5

Sometimes on a fine night we see a variety of appearances that form in the sky: 'chasms' for instance and 'trenches' and blood-red colours. These, too, have the same cause. For we have seen that the upper air condenses into an inflammable condition and that the combustion sometimes takes on the appearance of a burning flame, sometimes that of moving torches and stars. So it is not surprising that this same air when condensing should assume a variety of colours. For a weak light shining through a dense air, and the air when it acts as a mirror, will cause all kinds of colours to appear, but especially crimson and purple. For these colours generally appear when fire-colour and white are combined by superposition. Thus on a hot day, or through a smoky, medium, the stars when they rise and set look crimson. The light will also create colours by reflection when the mirror is such as to reflect colour only and not shape.

These appearances do not persist long, because the condensation of the air is transient.

'Chasms' get their appearance of depth from light breaking out of a dark blue or black mass of air. When the process of condensation goes further in such a case we often find 'torches' ejected. When the 'chasm' contracts it presents the appearance of a 'trench'.

In general, white in contrast with black creates a variety of colours; like flame, for instance, through a medium of smoke. But by day the sun obscures them, and, with the exception of crimson, the colours are not seen at night because they are dark.

These then must be taken to be the causes of 'shooting-stars' and the phenomena of combustion and also of the other transient appearances of this kind.

6

Let us go on to explain the nature of comets and the 'milky way', after a preliminary discussion of the views of others.

Anaxagoras and Democritus declare that comets are a conjunction of the planets approaching one another and so appearing to touch one another.

Some of the Italians called Pythagoreans say that the comet is one of the planets, but that it appears at great intervals of time and only rises a little above the horizon. This is the case with Mercury too; because it only rises a little above the horizon it often fails to be seen and consequently appears at great intervals of time.

A view like theirs was also expressed by Hippocrates of Chios and his pupil Aeschylus. Only they say that the tail does not belong to the comet iself, but is occasionally assumed by it on its course in certain situations, when our sight is reflected to the sun from the moisture attracted by the comet. It appears at greater intervals than the other stars because it is slowest to get clear of the sun and has been left behind by the sun to the extent of the whole of its circle before it reappears at the same point. It gets clear of the sun both towards the north and towards the south. In the space between the tropics it does not draw water to itself because that region is dried up by the sun on its course. When it moves towards the south it has no lack of the necessary moisture, but because the segment of its circle which is above the horizon is small, and that below it many times as large, it is impossible for the sun to be reflected to our sight, either when it approaches the southern tropic, or at the summer solstice. Hence in these regions it does not develop a

tail at all. But when it is visible in the north it assumes a tail because the arc above the horizon is large and that below it small. For under these circumstances there is nothing to prevent our vision from being reflected to the sun.

These views involve impossibilities, some of which are common to all of them, while others are peculiar to some only.

This is the case, first, with those who say that the comet is one of the planets. For all the planets appear in the circle of the zodiac, whereas many comets have been seen outside that circle. Again more comets than one have often appeared simultaneously. Besides, if their tail is due to reflection, as Aeschylus and Hippocrates say, this planet ought sometimes to be visible without a tail since, as they it does not possess a tail in every place in which it appears. But, as a matter of fact, no planet has been observed besides the five. And all of them are often visible above the horizon together at the same time. Further, comets are often found to appear, as well when all the planets are visible as when some are not, but are obscured by the neighbourhood of the sun. Moreover the statement that a comet only appears in the north, with the sun at the summer solstice, is not true either. The great comet which appeared at the time of the earthquake in Achaea and the tidal wave rose due west; and many have been known to appear in the south. Again in the archonship of Euclees, son of Molon, at Athens there appeared a comet in the north in the month Gamelion, the sun being about the winter solstice. Yet they themselves admit that reflection over so great a space is an impossibility.

An objection that tells equally against those who hold this theory and those who say that comets are a coalescence of the planets is, first, the fact that some of the fixed stars too get a tail. For this we must not only accept the authority of the Egyptians who assert it, but we have ourselves observed the

fact. For a star in the thigh of the Dog had a tail, though a faint one. If you fixed your sight on it its light was dim, but if you just glanced at it, it appeared brighter. Besides, all the comets that have been seen in our day have vanished without setting, gradually fading away above the horizon; and they have not left behind them either one or more stars. For instance the great comet we mentioned before appeared to the west in winter in frosty weather when the sky was clear, in the archonship of Asteius. On the first day it set before the sun and was then not seen. On the next day it was seen, being ever so little behind the sun and immediately setting. But its light extended over a third part of the sky like a leap, so that people called it a 'path'. This comet receded as far as Orion's belt and there dissolved. Democritus however, insists upon the truth of his view and affirms that certain stars have been seen when comets dissolve. But on his theory this ought not to occur occasionally but always. Besides, the Egyptians affirm that conjunctions of the planets with one another, and with the fixed stars, take place, and we have ourselves observed Jupiter coinciding with one of the stars in the Twins and hiding it, and yet no comet was formed. Further, we can also give a rational proof of our point. It is true that some stars seem to be bigger than others, yet each one by itself looks indivisible. Consequently, just as, if they really had been indivisible, their conjunction could not have created any greater magnitude, so now that they are not in fact indivisible but look as if they were, their conjunction will not make them look any bigger.

Enough has been said, without further argument, to show that the causes brought forward to explain comets are false.

7

We consider a satisfactory explanation of phenomena inaccessible to observation to have been given when our account of them is free from impossibilities. The observations before us suggest the following account of the phenomena we are now considering. We know that the dry and warm exhalation is the outermost part of the terrestrial world which falls below the circular motion. It, and a great part of the air that is continuous with it below, is carried round the earth by the motion of the circular revolution. In the course of this motion it often ignites wherever it may happen to be of the right consistency, and this we maintain to be the cause of the 'shooting' of scattered 'stars'. We may say, then, that a comet is formed when the upper motion introduces into a gathering of this kind a fiery principle not of such excessive strength as to burn up much of the material quickly, nor so weak as soon to be extinguished, but stronger and capable of burning up much material, and when exhalation of the right consistency rises from below and meets it. The kind of comet varies according to the shape which the exhalation happens to take. If it is diffused equally on every side the star is said to be fringed, if it stretches out in one direction it is called bearded. We have seen that when a fiery principle of this kind moves we seem to have a shooting-star: similarly when it stands still we seem to have a star standing still. We may compare these phenomena to a heap or mass of chaff into which a torch is thrust, or a spark thrown. That is what a shooting-star is like. The fuel is so inflammable that the fire runs through it quickly in a line. Now if this fire were to persist instead of running through the fuel and perishing away, its course through the fuel would stop at the point where the latter was densest, and then the whole might begin to move. Such is a comet – like a shooting-star that contains its beginning and end in itself.

When the matter begins to gather in the lower region independently the comet appears by itself. But when the exhalation is constituted by one of the fixed stars or the planets, owing to their motion, one of them becomes a comet. The fringe is not close to the stars themselves. Just as haloes appear to follow the sun and the moon as they move, and encircle them, when the air is dense enough for them to form along under the sun's course, so too the fringe. It stands in the relation of a halo to the stars, except that the colour of the halo is due to reflection, whereas in the case of comets the colour is something that appears actually on them.

Now when this matter gathers in relation to a star the comet necessarily appears to follow the same course as the star. But when the comet is formed independently it falls behind the motion of the universe, like the rest of the terrestrial world. It is this fact, that a comet often forms independently, indeed oftener than round one of the regular stars, that makes it impossible to maintain that a comet is a sort of reflection, not indeed, as Hippocrates and his school say, to the sun, but to the very star it is alleged to accompany – in fact, a kind of halo in the pure fuel of fire.

As for the halo we shall explain its cause later.

The fact that comets when frequent foreshadow wind and drought must be taken as an indication of their fiery constitution. For their origin is plainly due to the plentiful supply of that secretion. Hence the air is necessarily drier and the moist evaporation is so dissolved and dissipated by the quantity of the hot exhalation as not readily to condense into water. – But this phenomenon too shall be explained more clearly later when the time comes to speak of the winds. – So when there are many comets and they are dense, it is as we say, and the years are clearly dry and windy. When they are fewer

and fainter this effect does not appear in the same degree, though as a rule the is found to be excessive either in duration or strength. For instance when the stone at Aegospotami fell out of the air – it had been carried up by a wind and fell down in the daytime – then too a comet happened to have appeared in the west. And at the time of the great comet the winter was dry and north winds prevailed, and the wave was due to an opposition of winds. For in the gulf a north wind blew and outside it a violent south wind. Again in the archonship of Nicomachus a comet appeared for a few days about the equinoctial circle (this one had not risen in the west), and simultaneously with it there happened the storm at Corinth.

That there are few comets and that they appear rarely and outside the tropic circles more than within them is due to the motion of the sun and the stars. For this motion does not only cause the hot principle to be secreted but also dissolves it when it is gathering. But the chief reason is that most of this stuff collects in the region of the milky way.

8

Let us now explain the origin, cause, and nature of the milky way. And here too let us begin by discussing the statements of others on the subject.

(1) Of the so-called Pythagoreans some say that this is the path of one of the stars that fell from heaven at the time of Phaethon's downfall. Others say that the sun used once to move in this circle and that this region was scorched or met with some other affection of this kind, because of the sun and its motion.

But it is absurd not to see that if this were the reason the circle of the Zodiac ought to be affected in the same way, and indeed more so than that of the milky way, since not the sun only but all the planets move in it. We can see the whole of this circle (half of it being visible at any time of the night), but it shows no signs of any such affection except where a part of it touches the circle of the milky way.

(2) Anaxagoras, Democritus, and their schools say that the milky way is the light of certain stars. For, they say, when the sun passes below the earth some of the stars are hidden from it. Now the light of those on which the sun shines is invisible, being obscured by the of the sun. But the milky way is the peculiar light of those stars which are shaded by the earth from the sun's rays.

This, too, is obviously impossible. The milky way is always unchanged and among the same constellations (for it is clearly a greatest circle), whereas, since the sun does not remain in the same place, what is hidden from it differs at different times. Consequently with the change of the sun's position the milky way ought to change its position too: but we find that this does not happen. Besides, if astronomical demonstrations are correct and the size of the sun is greater than that of the earth and the distance of the stars from the earth many times greater than that of the sun (just as the sun is further from the earth than the moon), then the cone made by the rays of the sun would terminate at no great distance from the earth, and the shadow of the earth (what we call night) would not reach the stars. On the contrary, the sun shines on all the stars and the earth screens none of them.

(3) There is a third theory about the milky way. Some say that it is a reflection of our sight to the sun, just as they say that the comet is.

But this too is impossible. For if the eye and the mirror and the whole of the object were severally at rest, then the same part of the image would appear at the same point in the mirror. But if the mirror and the object move, keeping the same distance from the eye which is at rest, but at different rates of speed and so not always at the same interval from one another, then it is impossible for the same image always to appear in the same part of the mirror. Now the constellations included in the circle of the milky way move; and so does the sun, the object to which our sight is reflected; but we stand still. And the distance of those two from us is constant and uniform, but their distance from one another varies. For the Dolphin sometimes rises at midnight, sometimes in the morning. But in each case the same parts of the milky way are found near it. But if it were a reflection and not a genuine affection of these this ought not to be the case.

Again, we can see the milky way reflected at night in water and similar mirrors. But under these circumstances it is impossible for our sight to be reflected to the sun.

These considerations show that the milky way is not the path of one of the planets, nor the light of imperceptible stars, nor a reflection. And those are the chief theories handed down by others hitherto.

Let us recall our fundamental principle and then explain our views. We have already laid down that the outermost part of what is called the air is potentially fire and that therefore when the air is dissolved by motion, there is separated off a kind of matter – and of this matter we assert that comets consist. We must suppose that what happens is the same as in the case of the comets when the matter does not form independently but is formed by one of the fixed stars or the planets. Then these stars appear to be fringed, because matter of this kind follows their

course. In the same way, a certain kind of matter follows the sun, and we explain the halo as a reflection from it when the air is of the right constitution. Now we must assume that what happens in the case of the stars severally happens in the case of the whole of the heavens and all the upper motion. For it is natural to suppose that, if the motion of a single star excites a flame, that of all the stars should have a similar result, and especially in that region in which the stars are biggest and most numerous and nearest to one another. Now the circle of the zodiac dissolves this kind of matter because of the motion of the sun and the planets, and for this reason most comets are found outside the tropic circles. Again, no fringe appears round the sun or moon: for they dissolve such matter too quickly to admit of its formation. But this circle in which the milky way appears to our sight is the greatest circle, and its position is such that it extends far outside the tropic circles. Besides the region is full of the biggest and brightest constellations and also of what called 'scattered' stars (you have only to look to see this clearly). So for these reasons all this matter is continually and ceaselessly collecting there. A proof of the theory is this: In the circle itself the light is stronger in that half where the milky way is divided, and in it the constellations are more numerous and closer to one another than in the other half; which shows that the cause of the light is the motion of the constellations and nothing else. For if it is found in the circle in which there are most constellations and at that point in the circle at which they are densest and contain the biggest and the most stars, it is natural to suppose that they are the true cause of the affection in question. The circle and the constellations in it may be seen in the diagram. The so-called 'scattered' stars it is not possible to set down in the same way on the sphere because none of them have an evident permanent position; but if you look up to the sky the point is clear. For in this circle alone are the intervals full of these stars: in the other circles there are

obvious gaps. Hence if we accept the cause assigned for the appearance of comets as plausible we must assume that the same kind of thing holds good of the milky way. For the fringe which in the former case is an affection of a single star here forms in the same way in relation to a whole circle. So if we are to define the milky way we may call it ‘a fringe attaching to the greatest circle, and due to the matter secreted’. This, as we said before, explains why there are few comets and why they appear rarely; it is because at each revolution of the heavens this matter has always been and is always being separated off and gathered into this region.

We have now explained the phenomena that occur in that part of the terrestrial world which is continuous with the motions of the heavens, namely, shooting-stars and the burning flame, comets and the milky way, these being the chief affections that appear in that region.

9

Let us go on to treat of the region which follows next in order after this and which immediately surrounds the earth. It is the region common to water and air, and the processes attending the formation of water above take place in it. We must consider the principles and causes of all these phenomena too as before. The efficient and chief and first cause is the circle in which the sun moves. For the sun as it approaches or recedes, obviously causes dissipation and condensation and so gives rise to generation and destruction. Now the earth remains but the moisture surrounding it is made to evaporate by the sun’s rays and the other heat from above, and rises. But when the heat which was raising it leaves it, in part dispersing to the higher

region, in part quenched through rising so far into the upper air, then the vapour cools because its heat is gone and because the place is cold, and condenses again and turns from air into water. And after the water has formed it falls down again to the earth.

The exhalation of water is vapour: air condensing into water is cloud. Mist is what is left over when a cloud condenses into water, and is therefore rather a sign of fine weather than of rain; for mist might be called a barren cloud. So we get a circular process that follows the course of the sun. For according as the sun moves to this side or that, the moisture in this process rises or falls. We must think of it as a river flowing up and down in a circle and made up partly of air, partly of water. When the sun is near, the stream of vapour flows upwards; when it recedes, the stream of water flows down: and the order of sequence, at all events, in this process always remains the same. So if 'Oceanus' had some secret meaning in early writers, perhaps they may have meant this river that flows in a circle about the earth.

So the moisture is always raised by the heat and descends to the earth again when it gets cold. These processes and, in some cases, their varieties are distinguished by special names. When the water falls in small drops it is called a drizzle; when the drops are larger it is rain.

10

Some of the vapour that is formed by day does not rise high because the ratio of the fire that is raising it to the water that is being raised is small. When this cools and descends at night it is called dew and hoar-frost. When the vapour is frozen before it has condensed to water again it is hoar-frost; and this appears

in winter and is commoner in cold places. It is dew when the vapour has condensed into water and the heat is not so great as to dry up the moisture that has been raised nor the cold sufficient (owing to the warmth of the climate or season) for the vapour itself to freeze. For dew is more commonly found when the season or the place is warm, whereas the opposite, as has been said, is the case with hoar-frost. For obviously vapour is warmer than water, having still the fire that raised it: consequently more cold is needed to freeze it.

Both dew and hoar-frost are found when the sky is clear and there is no wind. For the vapour could not be raised unless the sky were clear, and if a wind were blowing it could not condense.

The fact that hoar-frost is not found on mountains contributes to prove that these phenomena occur because the vapour does not rise high. One reason for this is that it rises from hollow and watery places, so that the heat that is raising it, bearing as it were too heavy a burden cannot lift it to a great height but soon lets it fall again. A second reason is that the motion of the air is more pronounced at a height, and this dissolves a gathering of this kind.

Everywhere, except in Pontus, dew is found with south winds and not with north winds. There the opposite is the case and it is found with north winds and not with south. The reason is the same as that which explains why dew is found in warm weather and not in cold. For the south wind brings warm, and the north, wintry weather. For the north wind is cold and so quenches the heat of the evaporation. But in Pontus the south wind does not bring warmth enough to cause evaporation, whereas the coldness of the north wind concentrates the heat by a sort of recoil, so that there is more evaporation and not less. This is a thing which we can often observe in other places

too. Wells, for instance, give off more vapour in a north than in a south wind. Only the north winds quench the heat before any considerable quantity of vapour has gathered, while in a south wind the evaporation is allowed to accumulate.

Water, once formed, does not freeze on the surface of the earth, in the way that it does in the region of the clouds.

11

From the latter there fall three bodies condensed by cold, namely rain, snow, hail. Two of these correspond to the phenomena on the lower level and are due to the same causes, differing from them only in degree and quantity.

Snow and hoar-frost are one and the same thing, and so are rain and dew: only there is a great deal of the former and little of the latter. For rain is due to the cooling of a great amount of vapour, for the region from which and the time during which the vapour is collected are considerable. But of dew there is little: for the vapour collects for it in a single day and from a small area, as its quick formation and scanty quantity show.

The relation of hoar-frost and snow is the same: when cloud freezes there is snow, when vapour freezes there is hoar-frost. Hence snow is a sign of a cold season or country. For a great deal of heat is still present and unless the cold were overpowering it the cloud would not freeze. For there still survives in it a great deal of the heat which caused the moisture to rise as vapour from the earth.

Hail on the other hand is found in the upper region, but the corresponding phenomenon in the vaporous region near the

earth is lacking. For, as we said, to snow in the upper region corresponds hoar-frost in the lower, and to rain in the upper region, dew in the lower. But there is nothing here to correspond to hail in the upper region. Why this is so will be clear when we have explained the nature of hail.

12

But we must go on to collect the facts bearing on the origin of it, both those which raise no difficulties and those which seem paradoxical.

Hail is ice, and water freezes in winter; yet hailstorms occur chiefly in spring and autumn and less often in the late summer, but rarely in winter and then only when the cold is less intense. And in general hailstorms occur in warmer, and snow in colder places. Again, there is a difficulty about water freezing in the upper region. It cannot have frozen before becoming water: and water cannot remain suspended in the air for any space of time. Nor can we say that the case is like that of particles of moisture which are carried up owing to their small size and rest on the iar (the water swimming on the air just as small particles of earth and gold often swim on water). In that case large drops are formed by the union of many small, and so fall down. This cannot take place in the case of hail, since solid bodies cannot coalesce like liquid ones. Clearly then drops of that size were suspended in the air or else they could not have been so large when frozen.

Some think that the cause and origin of hail is this. The cloud is thrust up into the upper atmosphere, which is colder because the reflection of the sun's rays from the earth ceases there, and upon its arrival there the water freezes. They think that this

explains why hailstorms are commoner in summer and in warm countries; the heat is greater and it thrusts the clouds further up from the earth. But the fact is that hail does not occur at all at a great height: yet it ought to do so, on their theory, just as we see that snow falls most on high mountains. Again clouds have often been observed moving with a great noise close to the earth, terrifying those who heard and saw them as portents of some catastrophe. Sometimes, too, when such clouds have been seen, without any noise, there follows a violent hailstorm, and the stones are of incredible size, and angular in shape. This shows that they have not been falling for long and that they were frozen near to the earth, and not as that theory would have it. Moreover, where the hailstones are large, the cause of their freezing must be present in the highest degree: for hail is ice as every one can see. Now those hailstones are large which are angular in shape. And this shows that they froze close to the earth, for those that fall far are worn away by the length of their fall and become round and smaller in size.

It clearly follows that the congelation does not take place because the cloud is thrust up into the cold upper region.

Now we see that warm and cold react upon one another by recoil. Hence in warm weather the lower parts of the earth are cold and in a frost they are warm. The same thing, we must suppose, happens in the air, so that in the warmer seasons the cold is concentrated by the surrounding heat and causes the cloud to go over into water suddenly. (For this reason rain-drops are much larger on warm days than in winter, and showers more violent. A shower is said to be more violent in proportion as the water comes down in a body, and this happens when the condensation takes place quickly, – though this is just the opposite of what Anaxagoras says. He says that this happens when the cloud has risen into the cold air; whereas we say that it happens when the cloud has descended into the warm air,

and that the more the further the cloud has descended). But when the cold has been concentrated within still more by the outer heat, it freezes the water it has formed and there is hail. We get hail when the process of freezing is quicker than the descent of the water. For if the water falls in a certain time and the cold is sufficient to freeze it in less, there is no difficulty about its having frozen in the air, provided that the freezing takes place in a shorter time than its fall. The nearer to the earth, and the more suddenly, this process takes place, the more violent is the rain that results and the larger the raindrops and the hailstones because of the shortness of their fall. For the same reason large raindrops do not fall thickly. Hail is rarer in summer than in spring and autumn, though commoner than in winter, because the air is drier in summer, whereas in spring it is still moist, and in autumn it is beginning to grow moist. It is for the same reason that hailstorms sometimes occur in the late summer as we have said.

The fact that the water has previously been warmed contributes to its freezing quickly: for so it cools sooner. Hence many people, when they want to cool hot water quickly, begin by putting it in the sun. So the inhabitants of Pontus when they encamp on the ice to fish (they cut a hole in the ice and then fish) pour warm water round their reeds that it may freeze the quicker, for they use the ice like lead to fix the reeds. Now it is in hot countries and seasons that the water which forms soon grows warm.

It is for the same reason that rain falls in summer and not in winter in Arabia and Ethiopia too, and that in torrents and repeatedly on the same day. For the concentration or recoil due to the extreme heat of the country cools the clouds quickly.

So much for an account of the nature and causes of rain, dew, snow, hoar-frost, and hail.

13

Let us explain the nature of winds, and all windy vapours, also of rivers and of the sea. But here, too, we must first discuss the difficulties involved: for, as in other matters, so in this no theory has been handed down to us that the most ordinary man could not have thought of.

Some say that what is called air, when it is in motion and flows, is wind, and that this same air when it condenses again becomes cloud and water, implying that the nature of wind and water is the same. So they define wind as a motion of the air. Hence some, wishing to say a clever thing, assert that all the winds are one wind, because the air that moves is in fact all of it one and the same; they maintain that the winds appear to differ owing to the region from which the air may happen to flow on each occasion, but really do not differ at all. This is just like thinking that all rivers are one and the same river, and the ordinary unscientific view is better than a scientific theory like this. If all rivers flow from one source, and the same is true in the case of the winds, there might be some truth in this theory; but if it is no more true in the one case than in the other, this ingenious idea is plainly false. What requires investigation is this: the nature of wind and how it originates, its efficient cause and whence they derive their source; whether one ought to think of the wind as issuing from a sort of vessel and flowing until the vessel is empty, as if let out of a wineskin, or, as painters represent the winds, as drawing their source from themselves.

We find analogous views about the origin of rivers. It is thought that the water is raised by the sun and descends in rain and

gathers below the earth and so flows from a great reservoir, all the rivers from one, or each from a different one. No water at all is generated, but the volume of the rivers consists of the water that is gathered into such reservoirs in winter. Hence rivers are always fuller in winter than in summer, and some are perennial, others not. Rivers are perennial where the reservoir is large and so enough water has collected in it to last out and not be used up before the winter rain returns. Where the reservoirs are smaller there is less water in the rivers, and they are dried up and their vessel empty before the fresh rain comes on.

But if any one will picture to himself a reservoir adequate to the water that is continuously flowing day by day, and consider the amount of the water, it is obvious that a receptacle that is to contain all the water that flows in the year would be larger than the earth, or, at any rate, not much smaller.

Though it is evident that many reservoirs of this kind do exist in many parts of the earth, yet it is unreasonable for any one to refuse to admit that air becomes water in the earth for the same reason as it does above it. If the cold causes the vaporous air to condense into water above the earth we must suppose the cold in the earth to produce this same effect, and recognize that there not only exists in it and flows out of it actually formed water, but that water is continually forming in it too.

Again, even in the case of the water that is not being formed from day to day but exists as such, we must not suppose as some do that rivers have their source in definite subterranean lakes. On the contrary, just as above the earth small drops form and these join others, till finally the water descends in a body as rain, so too we must suppose that in the earth the water at first trickles together little by little, and that the sources of the rivers drip, as it were, out of the earth and then unite. This is proved by facts. When men construct an aqueduct they collect the

water in pipes and trenches, as if the earth in the higher ground were sweating the water out. Hence, too, the head-waters of rivers are found to flow from mountains, and from the greatest mountains there flow the most numerous and greatest rivers. Again, most springs are in the neighbourhood of mountains and of high ground, whereas if we except rivers, water rarely appears in the plains. For mountains and high ground, suspended over the country like a saturated sponge, make the water ooze out and trickle together in minute quantities but in many places. They receive a great deal of water falling as rain (for it makes no difference whether a spongy receptacle is concave and turned up or convex and turned down: in either case it will contain the same volume of matter) and, they also cool the vapour that rises and condense it back into water.

Hence, as we said, we find that the greatest rivers flow from the greatest mountains. This can be seen by looking at itineraries: what is recorded in them consists either of things which the writer has seen himself or of such as he has compiled after inquiry from those who have seen them.

In Asia we find that the most numerous and greatest rivers flow from the mountain called Parnassus, admittedly the greatest of all mountains towards the south-east. When you have crossed it you see the outer ocean, the further limit of which is unknown to the dwellers in our world. Besides other rivers there flow from it the Bactrus, the Choaspes, the Araxes: from the last a branch separates off and flows into lake Maeotis as the Tanais. From it, too, flows the Indus, the volume of whose stream is greatest of all rivers. From the Caucasus flows the Phasis, and very many other great rivers besides. Now the Caucasus is the greatest of the mountains that lie to the northeast, both as regards its extent and its height. A proof of its height is the fact that it can be seen from the so-called 'deeps' and from the entrance to the lake. Again, the sun shines on its peaks for a

third part of the night before sunrise and again after sunset. Its extent is proved by the fact that thought contains many inhabitable regions which are occupied by many nations and in which there are said to be great lakes, yet they say that all these regions are visible up to the last peak. From Pyrene (this is a mountain towards the west in Celtice) there flow the Istrus and the Tartessus. The latter flows outside the pillars, while the Istrus flows through all Europe into the Euxine. Most of the remaining rivers flow northwards from the Hercynian mountains, which are the greatest in height and extent about that region. In the extreme north, beyond furthest Scythia, are the mountains called Rhipae. The stories about their size are altogether too fabulous: however, they say that the most and (after the Istrus) the greatest rivers flow from them. So, too, in Libya there flow from the Aethiopian mountains the Aegon and the Nyses; and from the so-called Silver Mountain the two greatest of named rivers, the river called Chremetes that flows into the outer ocean, and the main source of the Nile. Of the rivers in the Greek world, the Achelous flows from Pindus, the Inachus from the same mountain; the Strymon, the Nestus, and the Hebrus all three from Scombrus; many rivers, too, flow from Rhodope.

All other rivers would be found to flow in the same way, but we have mentioned these as examples. Even where rivers flow from marshes, the marshes in almost every case are found to lie below mountains or gradually rising ground.

It is clear then that we must not suppose rivers to originate from definite reservoirs: for the whole earth, we might almost say, would not be sufficient (any more than the region of the clouds would be) if we were to suppose that they were fed by actually existing water only and it were not the case that as some water passed out of existence some more came into existence, but rivers always drew their stream from an existing

store. Secondly, the fact that rivers rise at the foot of mountains proves that a place transmits the water it contains by gradual percolation of many drops, little by little, and that this is how the sources of rivers originate. However, there is nothing impossible about the existence of such places containing a quantity of water like lakes: only they cannot be big enough to produce the supposed effect. To think that they are is just as absurd as if one were to suppose that rivers drew all their water from the sources we see (for most rivers do flow from springs). So it is no more reasonable to suppose those lakes to contain the whole volume of water than these springs.

That there exist such chasms and cavities in the earth we are taught by the rivers that are swallowed up. They are found in many parts of the earth: in the Peloponnesus, for instance, there are many such rivers in Arcadia. The reason is that Arcadia is mountainous and there are no channels from its valleys to the sea. So these places get full of water, and this, having no outlet, under the pressure of the water that is added above, finds a way out for itself underground. In Greece this kind of thing happens on quite a small scale, but the lake at the foot of the Caucasus, which the inhabitants of these parts call a sea, is considerable. Many great rivers fall into it and it has no visible outlet but issues below the earth off the land of the Coraxi about the so-called 'deeps of Pontus'. This is a place of unfathomable depth in the sea: at any rate no one has yet been able to find bottom there by sounding. At this spot, about three hundred stadia from land, there comes up sweet water over a large area, not all of it together but in three places. And in Liguria a river equal in size to the Rhodanus is swallowed up and appears again elsewhere: the Rhodanus being a navigable river.

14

The same parts of the earth are not always moist or dry, but they change according as rivers come into existence and dry up. And so the relation of land to sea changes too and a place does not always remain land or sea throughout all time, but where there was dry land there comes to be sea, and where there is now sea, there one day comes to be dry land. But we must suppose these changes to follow some order and cycle. The principle and cause of these changes is that the interior of the earth grows and decays, like the bodies of plants and animals. Only in the case of these latter the process does not go on by parts, but each of them necessarily grows or decays as a whole, whereas it does go on by parts in the case of the earth. Here the causes are cold and heat, which increase and diminish on account of the sun and its course. It is owing to them that the parts of the earth come to have a different character, that some parts remain moist for a certain time, and then dry up and grow old, while other parts in their turn are filled with life and moisture. Now when places become drier the springs necessarily give out, and when this happens the rivers first decrease in size and then finally become dry; and when rivers change and disappear in one part and come into existence correspondingly in another, the sea must needs be affected.

If the sea was once pushed out by rivers and encroached upon the land anywhere, it necessarily leaves that place dry when it recedes; again, if the dry land has encroached on the sea at all by a process of silting set up by the rivers when at their full, the time must come when this place will be flooded again.

But the whole vital process of the earth takes place so gradually and in periods of time which are so immense compared with the length of our life, that these changes are not observed, and before their course can be recorded from beginning to end

whole nations perish and are destroyed. Of such destructions the most utter and sudden are due to wars; but pestilence or famine cause them too. Famines, again, are either sudden and severe or else gradual. In the latter case the disappearance of a nation is not noticed because some leave the country while others remain; and this goes on until the land is unable to maintain any inhabitants at all. So a long period of time is likely to elapse from the first departure to the last, and no one remembers and the lapse of time destroys all record even before the last inhabitants have disappeared. In the same way a nation must be supposed to lose account of the time when it first settled in a land that was changing from a marshy and watery state and becoming dry. Here, too, the change is gradual and lasts a long time and men do not remember who came first, or when, or what the land was like when they came. This has been the case with Egypt. Here it is obvious that the land is continually getting drier and that the whole country is a deposit of the river Nile. But because the neighbouring peoples settled in the land gradually as the marshes dried, the lapse of time has hidden the beginning of the process. However, all the mouths of the Nile, with the single exception of that at Canopus, are obviously artificial and not natural. And Egypt was nothing more than what is called Thebes, as Homer, too, shows, modern though he is in relation to such changes. For Thebes is the place that he mentions; which implies that Memphis did not yet exist, or at any rate was not as important as it is now. That this should be so is natural, since the lower land came to be inhabited later than that which lay higher. For the parts that lie nearer to the place where the river is depositing the silt are necessarily marshy for a longer time since the water always lies most in the newly formed land. But in time this land changes its character, and in its turn enjoys a period of prosperity. For these places dry up and come to be in good condition while the places that were formerly well-tempered some day grow excessively dry and

deteriorate. This happened to the land of Argos and Mycenae in Greece. In the time of the Trojan wars the Argive land was marshy and could only support a small population, whereas the land of Mycenae was in good condition (and for this reason Mycenae was the superior). But now the opposite is the case, for the reason we have mentioned: the land of Mycenae has become completely dry and barren, while the Argive land that was formerly barren owing to the water has now become fruitful. Now the same process that has taken place in this small district must be supposed to be going on over whole countries and on a large scale.

Men whose outlook is narrow suppose the cause of such events to be change in the universe, in the sense of a coming to be of the world as a whole. Hence they say that the sea being dried up and is growing less, because this is observed to have happened in more places now than formerly. But this is only partially true. It is true that many places are now dry, that formerly were covered with water. But the opposite is true too: for if they look they will find that there are many places where the sea has invaded the land. But we must not suppose that the cause of this is that the world is in process of becoming. For it is absurd to make the universe to be in process because of small and trifling changes, when the bulk and size of the earth are surely as nothing in comparison with the whole world. Rather we must take the cause of all these changes to be that, just as winter occurs in the seasons of the year, so in determined periods there comes a great winter of a great year and with it excess of rain. But this excess does not always occur in the same place. The deluge in the time of Deucalion, for instance, took place chiefly in the Greek world and in it especially about ancient Hellas, the country about Dodona and the Achelous, a river which has often changed its course. Here the Selli dwelt and those who were formerly called Graeci and now Hellenes. When, therefore, such an excess of rain occurs we must

suppose that it suffices for a long time. We have seen that some say that the size of the subterranean cavities is what makes some rivers perennial and others not, whereas we maintain that the size of the mountains is the cause, and their density and coldness; for great, dense, and cold mountains catch and keep and create most water: whereas if the mountains that overhang the sources of rivers are small or porous and stony and clayey, these rivers run dry earlier. We must recognize the same kind of thing in this case too. Where such abundance of rain falls in the great winter it tends to make the moisture of those places almost everlasting. But as time goes on places of the latter type dry up more, while those of the former, moist type, do so less: until at last the beginning of the same cycle returns.

Since there is necessarily some change in the whole world, but not in the way of coming into existence or perishing (for the universe is permanent), it must be, as we say, that the same places are not for ever moist through the presence of sea and rivers, nor for ever dry. And the facts prove this. The whole land of the Egyptians, whom we take to be the most ancient of men, has evidently gradually come into existence and been produced by the river. This is clear from an observation of the country, and the facts about the Red Sea suffice to prove it too. One of their kings tried to make a canal to it (for it would have been of no little advantage to them for the whole region to have become navigable; Sesostris is said to have been the first of the ancient kings to try), but he found that the sea was higher than the land. So he first, and Darius afterwards, stopped making the canal, lest the sea should mix with the river water and spoil it. So it is clear that all this part was once unbroken sea. For the same reason Libya – the country of Ammon – is, strangely enough, lower and hollower than the land to the seaward of it. For it is clear that a barrier of silt was formed and after it lakes and dry land, but in course of time the water that was left behind in the lakes dried up and is now all gone. Again the

silting up of the lake Maeotis by the rivers has advanced so much that the limit to the size of the ships which can now sail into it to trade is much lower than it was sixty years ago. Hence it is easy to infer that it, too, like most lakes, was originally produced by the rivers and that it must end by drying up entirely.

Again, this process of silting up causes a continuous current through the Bosporus; and in this case we can directly observe the nature of the process. Whenever the current from the Asiatic shore threw up a sandbank, there first formed a small lake behind it. Later it dried up and a second sandbank formed in front of the first and a second lake. This process went on uniformly and without interruption. Now when this has been repeated often enough, in the course of time the strait must become like a river, and in the end the river itself must dry up.

So it is clear, since there will be no end to time and the world is eternal, that neither the Tanais nor the Nile has always been flowing, but that the region whence they flow was once dry: for their effect may be fulfilled, but time cannot. And this will be equally true of all other rivers. But if rivers come into existence and perish and the same parts of the earth were not always moist, the sea must needs change correspondingly. And if the sea is always advancing in one place and receding in another it is clear that the same parts of the whole earth are not always either sea or land, but that all this changes in course of time.

So we have explained that the same parts of the earth are not always land or sea and why that is so: and also why some rivers are perennial and others not.

Book II

1

Let us explain the nature of the sea and the reason why such a large mass of water is salt and the way in which it originally came to be.

The old writers who invented theogonies say that the sea has springs, for they want earth and sea to have foundations and roots of their own. Presumably they thought that this view was grander and more impressive as implying that our earth was an important part of the universe. For they believed that the whole world had been built up round our earth and for its sake, and that the earth was the most important and primary part of it. Others, wiser in human knowledge, give an account of its origin. At first, they say, the earth was surrounded by moisture. Then the sun began to dry it up, part of it evaporated and is the cause of winds and the turnings back of the sun and the moon, while the remainder forms the sea. So the sea is being dried up and is growing less, and will end by being some day entirely dried up. Others say that the sea is a kind of sweat exuded by the earth when the sun heats it, and that this explains its saltness: for all sweat is salt. Others say that the saltness is due to the earth. Just as water strained through ashes becomes salt, so the sea owes its saltness to the admixture of earth with similar properties.

We must now consider the facts which prove that the sea cannot possibly have springs. The waters we find on the earth either flow or are stationary. All flowing water has springs. (By a spring, as we have explained above, we must not understand a source from which waters are ladled as it were from a vessel,

but a first point at which the water which is continually forming and percolating gathers.) Stationary water is either that which has collected and has been left standing, marshy pools, for instance, and lakes, which differ merely in size, or else it comes from springs. In this case it is always artificial, I mean as in the case of wells, otherwise the spring would have to be above the outlet. Hence the water from fountains and rivers flows of itself, whereas wells need to be worked artificially. All the waters that exist belong to one or other of these classes.

On the basis of this division we can sec that the sea cannot have springs. For it falls under neither of the two classes; it does not flow and it is not artificial; whereas all water from springs must belong to one or other of them. Natural standing water from springs is never found on such a large scale.

Again, there are several seas that have no communication with one another at all. The Red Sea, for instance, communicates but slightly with the ocean outside the straits, and the Hyrcanian and Caspian seas are distinct from this ocean and people dwell all round them. Hence, if these seas had had any springs anywhere they must have been discovered.

It is true that in straits, where the land on either side contracts an open sea into a small space, the sea appears to flow. But this is because it is swinging to and fro. In the open sea this motion is not observed, but where the land narrows and contracts the sea the motion that was imperceptible in the open necessarily strikes the attention.

The whole of the Mediterranean does actually flow. The direction of this flow is determined by the depth of the basins and by the number of rivers. Maeotis flows into Pontus and Pontus into the Aegean. After that the flow of the remaining seas is not so easy to observe. The current of Maeotis and Pontus is due to the number of rivers (more rivers flow into the

Euxine and Maeotis than into the whole Mediterranean with its much larger basin), and to their own shallowness. For we find the sea getting deeper and deeper. Pontus is deeper than Maeotis, the Aegean than Pontus, the Sicilian sea than the Aegean; the Sardinian and Tyrrhenic being the deepest of all. (Outside the pillars of Heracles the sea is shallow owing to the mud, but calm, for it lies in a hollow.) We see, then, that just as single rivers flow from mountains, so it is with the earth as a whole: the greatest volume of water flows from the higher regions in the north. Their alluvium makes the northern seas shallow, while the outer seas are deeper. Some further evidence of the height of the northern regions of the earth is afforded by the view of many of the ancient meteorologists. They believed that the sun did not pass below the earth, but round its northern part, and that it was the height of this which obscured the sun and caused night.

So much to prove that there cannot be sources of the sea and to explain its observed flow.

2

We must now discuss the origin of the sea, if it has an origin, and the cause of its salt and bitter taste.

What made earlier writers consider the sea to be the original and main body of water is this. It seems reasonable to suppose that to be the case on the analogy of the other elements. Each of them has a main bulk which by reason of its mass is the origin of that element, and any parts which change and mix with the other elements come from it. Thus the main body of fire is in the upper region; that of air occupies the place next inside the region of fire; while the mass of the earth is that round which

the rest of the elements are seen to lie. So we must clearly look for something analogous in the case of water. But here we can find no such single mass, as in the case of the other elements, except the sea. River water is not a unity, nor is it stable, but is seen to be in a continuous process of becoming from day to day. It was this difficulty which made people regard the sea as the origin and source of moisture and of all water. And so we find it maintained that rivers not only flow into the sea but originate from it, the salt water becoming sweet by filtration.

But this view involves another difficulty. If this body of water is the origin and source of all water, why is it salt and not sweet? The reason for this, besides answering this question, will ensure our having a right first conception of the nature of the sea.

The earth is surrounded by water, just as that is by the sphere of air, and that again by the sphere called that of fire (which is the outermost both on the common view and on ours). Now the sun, moving as it does, sets up processes of change and becoming and decay, and by its agency the finest and sweetest water is every day carried up and is dissolved into vapour and rises to the upper region, where it is condensed again by the cold and so returns to the earth. This, as we have said before, is the regular course of nature.

Hence all my predecessors who supposed that the sun was nourished by moisture are absurdly mistaken. Some go on to say that the solstices are due to this, the reason being that the same places cannot always supply the sun with nourishment and that without it he must perish. For the fire we are familiar with lives as long as it is fed, and the only food for fire is moisture. As if the moisture that is raised could reach the sun! or this ascent were really like that performed by flame as it comes into being, and to which they supposed the case of the sun to be analogous! Really there is no similarity. A flame is a

process of becoming, involving a constant interchange of moist and dry. It cannot be said to be nourished since it scarcely persists as one and the same for a moment. This cannot be true of the sun; for if it were nourished like that, as they say it is, we should obviously not only have a new sun every day, as Heraclitus says, but a new sun every moment. Again, when the sun causes the moisture to rise, this is like fire heating water. So, as the fire is not fed by the water above it, it is absurd to suppose that the sun feeds on that moisture, even if its heat made all the water in the world evaporate. Again, it is absurd, considering the number and size of the stars, that these thinkers should consider the sun only and overlook the question how the rest of the heavenly bodies subsist. Again, they are met by the same difficulty as those who say that at first the earth itself was moist and the world round the earth was warmed by the sun, and so air was generated and the whole firmament grew, and the air caused winds and solstices. The objection is that we always plainly see the water that has been carried up coming down again. Even if the same amount does not come back in a year or in a given country, yet in a certain period all that has been carried up is returned. This implies that the celestial bodies do not feed on it, and that we cannot distinguish between some air which preserves its character once it is generated and some other which is generated but becomes water again and so perishes; on the contrary, all the moisture alike is dissolved and all of it condensed back into water.

The drinkable, sweet water, then, is light and is all of it drawn up: the salt water is heavy and remains behind, but not in its natural place. For this is a question which has been sufficiently discussed (I mean about the natural place that water, like the other elements, must in reason have), and the answer is this. The place which we see the sea filling is not its natural place but that of water. It seems to belong to the sea because the

weight of the salt water makes it remain there, while the sweet, drinkable water which is light is carried up. The same thing happens in animal bodies. Here, too, the food when it enters the body is sweet, yet the residuum and dregs of liquid food are found to be bitter and salt. This is because the sweet and drinkable part of it has been drawn away by the natural animal heat and has passed into the flesh and the other parts of the body according to their several natures. Now just as here it would be wrong for any one to refuse to call the belly the place of liquid food because that disappears from it soon, and to call it the place of the residuum because this is seen to remain, so in the case of our present subject. This place, we say, is the place of water. Hence all rivers and all the water that is generated flow into it: for water flows into the deepest place, and the deepest part of the earth is filled by the sea. Only all the light and sweet part of it is quickly carried off by the sun, while herest remains for the reason we have explained. It is quite natural that some people should have been puzzled by the old question why such a mass of water leaves no trace anywhere (for the sea does not increase though innumerable and vast rivers are flowing into it every day.) But if one considers the matter the solution is easy. The same amount of water does not take as long to dry up when it is spread out as when it is gathered in a body, and indeed the difference is so great that in the one case it might persist the whole day long while in the other it might all disappear in a moment – as for instance if one were to spread out a cup of water over a large table. This is the case with the rivers: all the time they are flowing their water forms a compact mass, but when it arrives at a vast wide place it quickly and imperceptibly evaporates.

But the theory of the Phaedo about rivers and the sea is impossible. There it is said that the earth is pierced by intercommunicating channels and that the original head and source of all waters is what is called Tartarus – a mass of water

about the centre, from which all waters, flowing and standing, are derived. This primary and original water is always surging to and fro, and so it causes the rivers to flow on this side of the earth's centre and on that; for it has no fixed seat but is always oscillating about the centre. Its motion up and down is what fills rivers. Many of these form lakes in various places (our sea is an instance of one of these), but all of them come round again in a circle to the original source of their flow, many at the same point, but some at a point opposite to that from which they issued; for instance, if they started from the other side of the earth's centre, they might return from this side of it. They descend only as far as the centre, for after that all motion is upwards. Water gets its tastes and colours from the kind of earth the rivers happened to flow through.

But on this theory rivers do not always flow in the same sense. For since they flow to the centre from which they issue forth they will not be flowing down any more than up, but in whatever direction the surging of Tartarus inclines to. But at this rate we shall get the proverbial rivers flowing upwards, which is impossible. Again, where is the water that is generated and what goes up again as vapour to come from? For this must all of it simply be ignored, since the quantity of water is always the same and all the water that flows out from the original source flows back to it again. This itself is not true, since all rivers are seen to end in the sea except where one flows into another. Not one of them ends in the earth, but even when one is swallowed up it comes to the surface again. And those rivers are large which flow for a long distance through a lowying country, for by their situation and length they cut off the course of many others and swallow them up. This is why the Istrus and the Nile are the greatest of the rivers which flow into our sea. Indeed, so many rivers fall into them that there is disagreement as to the sources of them both. All of which is plainly impossible on the theory, and the more so as it derives the sea from Tartarus.

Enough has been said to prove that this is the natural place of water and not of the sea, and to explain why sweet water is only found in rivers, while salt water is stationary, and to show that the sea is the end rather than the source of water, analogous to the residual matter of all food, and especially liquid food, in animal bodies.

3

We must now explain why the sea is salt, and ask whether it eternally exists as identically the same body, or whether it did not exist at all once and some day will exist no longer, but will dry up as some people think.

Every one admits this, that if the whole world originated the sea did too; for they make them come into being at the same time. It follows that if the universe is eternal the same must be true of the sea. Any one who thinks like Democritus that the sea is diminishing and will disappear in the end reminds us of Aesop's tales. His story was that Charybdis had twice sucked in the sea: the first time she made the mountains visible; the second time the islands; and when she sucks it in for the last time she will dry it up entirely. Such a tale is appropriate enough to Aesop in a rage with the ferryman, but not to serious inquirers. Whatever made the sea remain at first, whether it was its weight, as some even of those who hold these views say (for it is easy to see the cause here), or some other reason – clearly the same thing must make it persist for ever. They must either deny that the water raised by the sun will return at all, or, if it does, they must admit that the sea persists for ever or as long as this process goes on, and again, that for the same period of time that sweet water must have been carried up beforehand. So the sea will never dry

up: for before that can happen the water that has gone up beforehand will return to it: for if you say that this happens once you must admit its recurrence. If you stop the sun's course there is no drying agency. If you let it go on it will draw up the sweet water as we have said whenever it approaches, and let it descend again when it recedes. This notion about the sea is derived from the fact that many places are found to be drier now than they once were. Why this is so we have explained. The phenomenon is due to temporary excess of rain and not to any process of becoming in which the universe or its parts are involved. Some day the opposite will take place and after that the earth will grow dry once again. We must recognize that this process always goes on thus in a cycle, for that is more satisfactory than to suppose a change in the whole world in order to explain these facts. But we have dwelt longer on this point than it deserves.

To return to the saltness of the sea: those who create the sea once for all, or indeed generate it at all, cannot account for its saltness. It makes no difference whether the sea is the residue of all the moisture that is about the earth and has been drawn up by the sun, or whether all the flavour existing in the whole mass of sweet water is due to the admixture of a certain kind of earth. Since the total volume of the sea is the same once the water that evaporated has returned, it follows that it must either have been salt at first too, or, if not at first, then not now either. If it was salt from the very beginning, then we want to know why that was so; and why, if salt water was drawn up then, that is not the case now.

Again, if it is maintained that an admixture of earth makes the sea salt (for they say that earth has many flavours and is washed down by the rivers and so makes the sea salt by its admixture), it is strange that rivers should not be salt too. How can the admixture of this earth have such a striking effect in a

great quantity of water and not in each river singly? For the sea, differing in nothing from rivers but in being salt, is evidently simply the totality of river water, and the rivers are the vehicle in which that earth is carried to their common destination.

It is equally absurd to suppose that anything has been explained by calling the sea 'the sweat of the earth', like Empedicles. Metaphors are poetical and so that expression of his may satisfy the requirements of a poem, but as a scientific theory it is unsatisfactory. Even in the case of the body it is a question how the sweet liquid drunk becomes salt sweat whether it is merely by the departure of some element in it which is sweetest, or by the admixture of something, as when water is strained through ashes. Actually the saltness seems to be due to the same cause as in the case of the residual liquid that gathers in the bladder. That, too, becomes bitter and salt though the liquid we drink and that contained in our food is sweet. If then the bitterness is due in these cases (as with the water strained through lye) to the presence of a certain sort of stuff that is carried along by the urine (as indeed we actually find a salt deposit settling in chamber-pots) and is secreted from the flesh in sweat (as if the departing moisture were washing the stuff out of the body), then no doubt the admixture of something earthy with the water is what makes the sea salt.

Now in the body stuff of this kind, viz. the sediment of food, is due to failure to digest: but how there came to be any such thing in the earth requires explanation. Besides, how can the drying and warming of the earth cause the secretion such a great quantity of water; especially as that must be a mere fragment of what is left in the earth? Again, waiving the question of quantity, why does not the earth sweat now when it happens to be in process of drying? If it did so then, it ought to do so now. But it does not: on the contrary, when it is dry it graws moist, but when it is moist it does not secrete anything at

all. How then was it possible for the earth at the beginning when it was moist to sweat as it grew dry? Indeed, the theory that maintains that most of the moisture departed and was drawn up by the sun and that what was left over is the sea is more reasonable; but for the earth to sweat when it is moist is impossible.

Since all the attempts to account for the saltness of the sea seem unsuccessful let us explain it by the help of the principle we have used already.

Since we recognize two kinds of evaporation, one moist, the other dry, it is clear that the latter must be recognized as the source of phenomena like those we are concerned with.

But there is a question which we must discuss first. Does the sea always remain numerically one and consisting of the same parts, or is it, too, one in form and volume while its parts are in continual change, like air and sweet water and fire? All of these are in a constant state of change, but the form and the quantity of each of them are fixed, just as they are in the case of a flowing river or a burning flame. The answer is clear, and there is no doubt that the same account holds good of all these things alike. They differ in that some of them change more rapidly or more slowly than others; and they all are involved in a process of perishing and becoming which yet affects them all in a regular course.

This being so we must go on to try to explain why the sea is salt. There are many facts which make it clear that this taste is due to the admixture of something. First, in animal bodies what is least digested, the residue of liquid food, is salt and bitter, as we said before. All animal excreta are undigested, but especially that which gathers in the bladder (its extreme lightness proves this; for everything that is digested is condensed), and also sweat; in these then is excreted (along with other matter) an

identical substance to which this flavour is due. The case of things burnt is analogous. What heat fails to assimilate becomes the excrementary residue in animal bodies, and, in things burnt, ashes. That is why some people say that it was burnt earth that made the sea salt. To say that it was burnt earth is absurd; but to say that it was something like burnt earth is true. We must suppose that just as in the cases we have described, so in the world as a whole, everything that grows and is naturally generated always leaves an undigested residue, like that of things burnt, consisting of this sort of earth. All the earthy stuff in the dry exhalation is of this nature, and it is the dry exhalation which accounts for its great quantity. Now since, as we have said, the moist and the dry evaporations are mixed, some quantity of this stuff must always be included in the clouds and the water that are formed by condensation, and must redescend to the earth in rain. This process must always go on with such regularity as the sublunary world admits of. and it is the answer to the question how the sea comes to be salt.

It also explains why rain that comes from the south, and the first rains of autumn, are brackish. The south is the warmest of winds and it blows from dry and hot regions. Hence it carries little moist vapour and that is why it is hot. (It makes no difference even if this is not its true character and it is originally a cold wind, for it becomes warm on its way by incorporating with itself a great quantity of dry evaporation from the places it passes over.) The north wind, on the other hand, comb ing from moist regions, is full of vapour and therefore cold. It is dry in our part of the world because it drives the clouds away before it, but in the south it is rainy; just as the south is a dry wind in Libya. So the south wind charges the rain that falls with a great quantity of this stuff. Autumn rain is brackish because the heaviest water must fall first; so that that which contains the greatest quantity of this kind of earth descends quickest.

This, too, is why the sea is warm. Everything that has been exposed to fire contains heat potentially, as we see in the case of lye and ashes and the dry and liquid excreta of animals. Indeed those animals which are hottest in the belly have the hottest excreta.

The action of this cause is continually making the sea more salt, but some part of its saltness is always being drawn up with the sweet water. This is less than the sweet water in the same ratio in which the salt and brackish element in rain is less than the sweet, and so the saltness of the sea remains constant on the whole. Salt water when it turns into vapour becomes sweet, and the vapour does not form salt water when it condenses again. This I know by experiment. The same thing is true in every case of the kind: wine and all fluids that evaporate and condense back into a liquid state become water. They all are water modified by a certain admixture, the nature of which determines their flavour. But this subject must be considered on another more suitable occasion.

For the present let us say this. The sea is there and some of it is continually being drawn up and becoming sweet; this returns from above with the rain. But it is now different from what it was when it was drawn up, and its weight makes it sink below the sweet water. This process prevents the sea, as it does rivers, from drying up except from local causes (this must happen to sea and rivers alike). On the other hand the parts neither of the earth nor of the sea remain constant but only their whole bulk. For the same thing is true of the earth as of the sea: some of it is carried up and some comes down with the rain, and both that which remains on the surface and that which comes down again change their situations.

There is more evidence to prove that saltness is due to the admixture of some substance, besides that which we have

adduced. Make a vessel of wax and put it in the sea, fastening its mouth in such a way as to prevent any water getting in. Then the water that percolates through the wax sides of the vessel is sweet, the earthy stuff, the admixture of which makes the water salt, being separated off as it were by a filter. It is this stuff which make salt water heavy (it weighs more than fresh water) and thick. The difference in consistency is such that ships with the same cargo very nearly sink in a river when they are quite fit to navigate in the sea. This circumstance has before now caused loss to shippers freighting their ships in a river. That the thicker consistency is due to an admixture of something is proved by the fact that if you make strong brine by the admixture of salt, eggs, even when they are full, float in it. It almost becomes like mud; such a quantity of earthy matter is there in the sea. The same thing is done in salting fish.

Again if, as is fabled, there is a lake in Palestine, such that if you bind a man or beast and throw it in it floats and does not sink, this would bear out what we have said. They say that this lake is so bitter and salt that no fish live in it and that if you soak clothes in it and shake them it cleans them. The following facts all of them support our theory that it is some earthy stuff in the water which makes it salt. In Chaonia there is a spring of brackish water that flows into a neighbouring river which is sweet but contains no fish. The local story is that when Heracles came from Erytheia driving the oxen and gave the inhabitants the choice, they chose salt in preference to fish. They get the salt from the spring. They boil off some of the water and let the rest stand; when it has cooled and the heat and moisture have evaporated together it gives them salt, not in lumps but loose and light like snow. It is weaker than ordinary salt and added freely gives a sweet taste, and it is not as white as salt generally is. Another instance of this is found in Umbria. There is a place there where reeds and rushes grow. They burn some of these,

put the ashes into water and boil it off. When a little water is left and has cooled it gives a quantity of salt.

Most salt rivers and springs must once have been hot. Then the original fire in them was extinguished but the earth through which they percolate preserves the character of lye or ashes. Springs and rivers with all kinds of flavours are found in many places. These flavours must in every case be due to the fire that is or was in them, for if you expose earth to different degrees of heat it assumes various kinds and shades of flavour. It becomes full of alum and lye and other things of the kind, and the fresh water percolates through these and changes its character. Sometimes it becomes acid as in Sicania, a part of Sicily. There they get a salt and acid water which they use as vinegar to season some of their dishes. In the neighbourhood of Lyncus, too, there is a spring of acid water, and in Scythia a bitter spring. The water from this makes the whole of the river into which it flows bitter. These differences are explained by a knowledge of the particular mixtures that determine different savours. But these have been explained in another treatise.

We have now given an account of waters and the sea, why they persist, how they change, what their nature is, and have explained most of their natural operations and affections.

4

Let us proceed to the theory of winds. Its basis is a distinction we have already made. We recognize two kinds of evaporation, one moist, the other dry. The former is called vapour: for the other there is no general name but we must call it a sort of smoke, applying to the whole of it a word that is proper to one of its forms. The moist cannot exist without the dry nor the dry

without the moist: whenever we speak of either we mean that it predominates. Now when the sun in its circular course approaches, it draws up by its heat the moist evaporation: when it recedes the cold makes the vapour that had been raised condense back into water which falls and is distributed through the earth. (This explains why there is more rain in winter and more by night than by day: though the fact is not recognized because rain by night is more apt to escape observation than by day.) But there is a great quantity of fire and heat in the earth, and the sun not only draws up the moisture that lies on the surface of it, but warms and dries the earth itself. Consequently, since there are two kinds of evaporation, as we have said, one like vapour, the other like smoke, both of them are necessarily generated. That in which moisture predominates is the source of rain, as we explained before, while the dry evaporation is the source and substance of all winds. That things must necessarily take this course is clear from the resulting phenomena themselves, for the evaporation that is to produce them must necessarily differ; and the sun and the warmth in the earth not only can but must produce these evaporations.

Since the two evaporations are specifically distinct, wind and rain obviously differ and their substance is not the same, as those say who maintain that one and the same air when in motion is wind, but when it condenses again is water. Air, as we have explained in an earlier book, is made up of these as constituents. Vapour is moist and cold (for its fluidity is due to its moistness, and because it derives from water it is naturally cold, like water that has not been warmed): whereas the smoky evaporation is hot and dry. Hence each contributes a part, and air is moist and hot. It is absurd that this air that surrounds us should become wind when in motion, whatever be the source of its motion on the contrary the case of winds is like that of rivers. We do not call water that flows anyhow a river, even if there is a great quantity of it, but only if the flow comes from a

spring. So too with the winds; a great quantity of air might be moved by the fall of some large object without flowing from any source or spring.

The facts bear out our theory. It is because the evaporation takes place uninterruptedly but differs in degree and quantity that clouds and winds appear in their natural proportion according to the season; and it is because there is now a great excess of the vaporous, now of the dry and smoky exhalation, that some years are rainy and wet, others windy and dry. Sometimes there is much drought or rain, and it prevails over a great and continuous stretch of country. At other times it is local; the surrounding country often getting seasonable or even excessive rains while there is drought in a certain part; or, contrariwise, all the surrounding country gets little or even no rain while a certain part gets rain in abundance. The reason for all this is that while the same affection is generally apt to prevail over a considerable district because adjacent places (unless there is something special to differentiate them) stand in the same relation to the sun, yet on occasion the dry evaporation will prevail in one part and the moist in another, or conversely. Again the reason for this latter is that each evaporation goes over to that of the neighbouring district: for instance, the dry evaporation circulates in its own place while the moist migrates to the next district or is even driven by winds to some distant place: or else the moist evaporation remains and the dry moves away. Just as in the case of the body when the stomach is dry the lower belly is often in the contrary state, and when it is dry the stomach is moist and cold, so it often happens that the evaporations reciprocally take one another's place and interchange.

Further, after rain wind generally rises in those places where the rain fell, and when rain has come on the wind ceases. These are necessary effects of the principles we have explained. After

rain the earth is being dried by its own heat and that from above and gives off the evaporation which we saw to be the material cause of. wind. Again, suppose this secretion is present and wind prevails; the heat is continually being thrown off, rising to the upper region, and so the wind ceases; then the fall in temperature makes vapour form and condense into water. Water also forms and cools the dry evaporation when the clouds are driven together and the cold concentrated in them. These are the causes that make wind cease on the advent of rain, and rain fall on the cessation of wind.

The cause of the predominance of winds from the north and from the south is the same. (Most winds, as a matter of fact, are north winds or south winds.) These are the only regions which the sun does not visit: it approaches them and recedes from them, but its course is always over the west and the east. Hence clouds collect on either side, and when the sun approaches it provokes the moist evaporation, and when it recedes to the opposite side there are storms and rain. So summer and winter are due to the sun's motion to and from the solstices, and water ascends and falls again for the same reason. Now since most rain falls in those regions towards which and from which the sun turns and these are the north and the south, and since most evaporation must take place where there is the greatest rainfall, just as green wood gives most smoke, and since this evaporation is wind, it is natural that the most and most important winds should come from these quarters. (The winds from the north are called Boreae, those from the south Noti.)

The course of winds is oblique: for though the evaporation rises straight up from the earth, they blow round it because all the surrounding air follows the motion of the heavens. Hence the question might be asked whether winds originate from above or from below. The motion comes from above: before we feel the wind blowing the air betrays its presence if there are clouds or a

mist, for their motion shows that the wind has begun to blow before it has actually reached us; and this implies that the source of winds is above. But since wind is defined as 'a quantity of dry evaporation from the earth moving round the earth', it is clear that while the origin of the motion is from above, the matter and the generation of wind come from below. The oblique movement of the rising evaporation is caused from above: for the motion of the heavens determines the processes that are at a distance from the earth, and the motion from below is vertical and every cause is more active where it is nearest to the effect; but in its generation and origin wind plainly derives from the earth.

The facts bear out the view that winds are formed by the gradual union of many evaporations just as rivers derive their sources from the water that oozes from the earth. Every wind is weakest in the spot from which it blows; as they proceed and leave their source at a distance they gather strength. Thus the winter in the north is windless and calm: that is, in the north itself; but, the breeze that blows from there so gently as to escape observation becomes a great wind as it passes on.

We have explained the nature and origin of wind, the occurrence of drought and rains, the reason why rain stops wind and wind rises after rain, the prevalence of north and south winds and also why wind moves in the way it does.

5

The sun both checks the formation of winds and stimulates it. When the evaporation is small in amount and faint the sun wastes it and dissipates by its greater heat the lesser heat contained in the evaporation. It also dries up the earth, the

source of the evaporation, before the latter has appeared in bulk: just as, when you throw a little fuel into a great fire, it is often burnt up before giving off any smoke. In these ways the sun checks winds and prevents them from rising at all: it checks them by wasting the evaporation, and prevents their rising by drying up the earth quickly. Hence calm is very apt to prevail about the rising of Orion and lasts until the coming of the Etesiae and their 'forerunners'.

Calm is due to two causes. Either cold quenches the evaporation, for instance a sharp frost: or excessive heat wastes it. In the intermediate periods, too, the causes are generally either that the evaporation has not had time to develop or that it has passed away and there is none as yet to replace it.

Both the setting and the rising of Orion are considered to be treacherous and stormy, because they place at a change of season (namely of summer or winter; and because the size of the constellation makes its rise last over many days) and a state of change is always indefinite and therefore liable to disturbance.

The Etesiae blow after the summer solstice and the rising of the dog-star: not at the time when the sun is closest nor when it is distant; and they blow by day and cease at night. The reason is that when the sun is near it dries up the earth before evaporation has taken place, but when it has receded a little its heat and the evaporation are present in the right proportion; so the ice melts and the earth, dried by its own heat and that of the sun, smokes and vapours. They abate at night because the cold pf the nights checks the melting of the ice. What is frozen gives off no evaporation, nor does that which contains no dryness at all: it is only where something dry contains moisture that it gives off evaporation under the influence of heat.

The question is sometimes asked: why do the north winds which we call the Etesiae blow continuously after the summer solstice, when there are no corresponding south winds after the winter solstice? The facts are reasonable enough: for the so-called 'white south winds' do blow at the corresponding season, though they are not equally continuous and so escape observation and give rise to this inquiry. The reason for this is that the north wind I from the arctic regions which are full of water and snow. The sun thaws them and so the Etesiae blow: after rather than at the summer solstice. (For the greatest heat is developed not when the sun is nearest to the north, but when its heat has been felt for a considerable period and it has not yet receded far. The 'bird winds' blow in the same way after the winter solstice. They, too, are weak Etesiae, but they blow less and later than the Etesiae. They begin to blow only on the seventieth day because the sun is distant and therefore weaker. They do not blow so continuously because only things on the surface of the earth and offering little resistance evaporate then, the thoroughly frozen parts requiring greater heat to melt them. So they blow intermittently till the true Etesiae come on again at the summer solstice: for from that time onwards the wind tends to blow continuously.) But the south wind blows from the tropic of Cancer and not from the antarctic region.

There are two inhabitable sections of the earth: one near our upper, or nothern pole, the other near the other or southern pole; and their shape is like that of a tambourine. If you draw lines from the centre of the earth they cut out a drum-shaped figure. The lines form two cones; the base of the one is the tropic, of the other the ever visible circle, their vertex is at the centre of the earth. Two other cones towards the south pole give corresponding segments of the earth. These sections alone are habitable. Beyond the tropics no one can live: for there the shade would not fall to the north, whereas the earth is known to be uninhabitable before the sun is in the zenith or the shade

is thrown to the south: and the regions below the Bear are uninhabitable because of the cold.

(The Crown, too, moves over this region: for it is in the zenith when it is on our meridian.)

So we see that the way in which they now describe the geography of the earth is ridiculous. They depict the inhabited earth as round, but both ascertained facts and general considerations show this to be impossible. If we reflect we see that the inhabited region is limited in breadth, while the climate admits of its extending all round the earth. For we meet with no excessive heat or cold in the direction of its length but only in that of its breadth; so that there is nothing to prevent our travelling round the earth unless the extent of the sea presents an obstacle anywhere. The records of journeys by sea and land bear this out. They make the length far greater than the breadth. If we compute these voyages and journeys the distance from the Pillars of Heracles to India exceeds that from Aethiopia to Maeotis and the northernmost Scythians by a ratio of more than 5 to 3, as far as such matters admit of accurate statement. Yet we know the whole breadth of the region we dwell in up to the uninhabited parts: in one direction no one lives because of the cold, in the other because of the heat.

But it is the sea which divides as it seems the parts beyond India from those beyond the Pillars of Heracles and prevents the earth from being inhabited all round.

Now since there must be a region bearing the same relation to the southern pole as the place we live in bears to our pole, it will clearly correspond in the ordering of its winds as well as in other things. So just as we have a north wind here, they must have a corresponding wind from the antarctic. This wind cannot reach us since our own north wind is like a land breeze and does not even reach the limits of the region we live in. The

prevalence of north winds here is due to our lying near the north. Yet even here they give out and fail to penetrate far: in the southern sea beyond Libya east and west winds are always blowing alternately, like north and south winds with us. So it is clear that the south wind is not the wind that blows from the south pole. It is neither that nor the wind from the winter tropic. For symmetry would require another wind blowing from the summer tropic, which there is not, since we know that only one wind blows from that quarter. So the south wind clearly blows from the torrid region. Now the sun is so near to that region that it has no water, or snow which might melt and cause Etesiae. But because that place is far more extensive and open the south wind is greater and stronger and warmer than the north and penetrates farther to the north than the north wind does to the south.

The origin of these winds and their relation to one another has now been explained.

6

Let us now explain the position of the winds, their oppositions, which can blow simultaneously with which, and which cannot, their names and number, and any other of their affections that have not been treated in the 'particular questions'. What we say about their position must be followed with the help of the figure. For clearness' sake we have drawn the circle of the horizon, which is round, but it represents the zone in which we live; for that can be divided in the same way. Let us also begin by laying down that those things are locally contrary which are locally most distant from one another, just as things specifically most remote from one another are specific contraries. Now

things that face one another from opposite ends of a diameter are locally most distant from one another. (See diagram.)

Let A be the point where the sun sets at the equinox and B, the point opposite, the place where it rises at the equinox. Let there be another diameter cutting this at right angles, and let the point H on it be the north and its diametrical opposite O the south. Let Z be the rising of the sun at the summer solstice and E its setting at the summer solstice; D its rising at the winter solstice, and G its setting at the winter solstice. Draw a diameter from Z to G from D to E. Then since those things are locally contrary which are most distant from one another in space, and points diametrically opposite are most distant from one another, those winds must necessarily be contrary to one another that blow from opposite ends of a diameter.

The names of the winds according to their position are these. Zephyrus is the wind that blows from A, this being the point where the sun sets at the equinox. Its contrary is Apeliotes blowing from B the point where the sun rises at the equinox. The wind blowing from H, the north, is the true north wind, called Aparctias: while Notus blowing from O is its contrary; for this point is the south and O is contrary to H, being diametrically opposite to it. Caecias blows from Z, where the sun rises at the summer solstice. Its contrary is not the wind blowing from E but Lips blowing from G. For Lips blows from the point where the sun sets at the winter solstice and is diametrically opposite to Caecias: so it is its contrary. Eurus blows from D, coming from the point where the sun rises at the winter solstice. It borders on Notus, and so we often find that people speak of ‘Euro-Noti’. Its contrary is not Lips blowing from G but the wind that blows from E which some call Argestes, some Olympias, and some Sciron. This blows from the point where the sun sets at the summer solstice, and is the only wind

that is diametrically opposite to Eurus. These are the winds that are diametrically opposite to one another and their contraries.

There are other winds which have no contraries. The wind they call Thrascias, which lies between Argestes and Aparctias, blows from I; and the wind called Meses, which lies between Caecias and Aparctias, from K. (The line IK nearly coincides with the ever visible circle, but not quite.) These winds have no contraries. Meses has not, or else there would be a wind blowing from the point M which is diametrically opposite. Thrascias corresponding to the point I has not, for then there would be a wind blowing from N, the point which is diametrically opposite. (But perhaps a local wind which the inhabitants of those parts call Phoenicias blows from that point.)

These are the most important and definite winds and these their places.

There are more winds from the north than from the south. The reason for this is that the region in which we live lies nearer to the north. Also, much more water and snow is pushed aside into this quarter because the other lies under the sun and its course. When this thaws and soaks into the earth and is exposed to the heat of the sun and the earth it necessarily causes evaporation to rise in greater quantities and over a greater space.

Of the winds we have described Aparctias is the north wind in the strict sense. Thrascias and Meses are north winds too. (Caecias is half north and half east.) South are that which blows from due south and Lips. East, the wind from the rising of the sun at the equinox and Eurus. Phoenicias is half south and half east. West, the wind from the true west and that called Argestes. More generally these winds are classified as northerly or southerly. The west winds are counted as northerly, for they blow from the place of sunset and are therefore colder; the east

winds as southerly, for they are warmer because they blow from the place of sunrise. So the distinction of cold and hot or warm is the basis for the division of the winds into northerly and southerly. East winds are warmer than west winds because the sun shines on the east longer, whereas it leaves the west sooner and reaches it later.

Since this is the distribution of the winds it is clear that contrary winds cannot blow simultaneously. They are diametrically opposite to one another and one of the two must be overpowered and cease. Winds that are not diametrically opposite to one another may blow simultaneously: for instance the winds from Z and from D. Hence it sometimes happens that both of them, though different winds and blowing from different quarters, are favourable to sailors making for the same point.

Contrary winds commonly blow at opposite seasons. Thus Caecias and in general the winds north of the summer solstice blow about the time of the spring equinox, but about the autumn equinox Lips; and Zephyrus about the summer solstice, but about the winter solstice Eurus.

Aparctias, Thrascias, and Argestes are the winds that fall on others most and stop them. Their source is so close to us that they are greater and stronger than other winds. They bring fair weather most of all winds for the same reason, for, blowing as they do, from close at hand, they overpower the other winds and stop them; they also blow away the clouds that are forming and leave a clear sky – unless they happen to be very cold. Then they do not bring fair weather, but being colder than they are strong they condense the clouds before driving them away.

Caecias does not bring fair weather because it returns upon itself. Hence the saying: ‘Bringing it on himself as Caecias does clouds.’

When they cease, winds are succeeded by their neighbours in the direction of the movement of the sun. For an effect is most apt to be produced in the neighbourhood of its cause, and the cause of winds moves with the sun.

Contrary winds have either the same or contrary effects. Thus Lips and Caecias, sometimes called Hellespontias, are both rainy gestes and Eurus are dry: the latter being dry at first and rainy afterwards. Meses and Aparctias are coldest and bring most snow. Aparctias, Thrascias, and Argestes bring hail. Notus, Zephyrus, and Eurus are hot. Caecias covers the sky with heavy clouds, Lips with lighter ones. Caecias does this because it returns upon itself and combines the qualities of Boreas and Eurus. By being cold it condenses and gathers the vaporous air, and because it is easterly it carries with it and drives before it a great quantity of such matter. Aparctias, Thrascias, and Argestes bring fair weather for the reason we have explained before. These winds and Meses are most commonly accompanied by lightning. They are cold because they blow from the north, and lightning is due to cold, being ejected when the clouds contract. Some of these same bring hail with them for the same reason; namely, that they cause a sudden condensation.

Hurricanes are commonest in autumn, and next in spring: Aparctias, Thrascias, and Argestes give rise to them most. This is because hurricanes are generally formed when some winds are blowing and others fall on them; and these are the winds which are most apt to fall on others that are blowing; the reason for which, too, we have explained before.

The Etesiae veer round: they begin from the north, and become for dwellers in the west Thrasciae, Argestae, and Zephyrus (for Zephyrus belongs to the north). For dwellers in the east they veer round as far as Apeliotes.

So much for the winds, their origin and nature and the properties common to them all or peculiar to each.

7

We must go on to discuss earthquakes next, for their cause is akin to our last subject.

The theories that have been put forward up to the present date are three, and their authors three men, Anaxagoras of Clazomenae, and before him Anaximenes of Miletus, and later Democritus of Abdera.

Anaxagoras says that the ether, which naturally moves upwards, is caught in hollows below the earth and so shakes it, for though the earth is really all of it equally porous, its surface is clogged up by rain. This implies that part of the whole sphere is 'above' and part 'below': 'above' being the part on which we live, 'below' the other.

This theory is perhaps too primitive to require refutation. It is absurd to think of up and down otherwise than as meaning that heavy bodies move to the earth from every quarter, and light ones, such as fire, away from it; especially as we see that, as far as our knowledge of the earth goes, the horizon always changes with a change in our position, which proves that the earth is convex and spherical. It is absurd, too, to maintain that the earth rests on the air because of its size, and then to say that impact upwards from below shakes it right through. Besides he gives no account of the circumstances attendant on earthquakes: for not every country or every season is subject to them.

Democritus says that the earth is full of water and that when a quantity of rain-water is added to this an earthquake is the result. The hollows in the earth being unable to admit the excess of water it forces its way in and so causes an earthquake. Or again, the earth as it dries draws the water from the fuller to the emptier parts, and the inrush of the water as it changes its place causes the earthquake.

Anaximenes says that the earth breaks up when it grows wet or dry, and earthquakes are due to the fall of these masses as they break away. Hence earthquakes take place in times of drought and again of heavy rain, since, as we have explained, the earth grows dry in time of drought and breaks up, whereas the rain makes it sodden and destroys its cohesion.

But if this were the case the earth ought to be found to be sinking in many places. Again, why do earthquakes frequently occur in places which are not excessively subject to drought or rain, as they ought to be on the theory? Besides, on this view, earthquakes ought always to be getting fewer, and should come to an end entirely some day: the notion of contraction by packing together implies this. So this is impossible the theory must be impossible too.

8

We have already shown that wet and dry must both give rise to an evaporation: earthquakes are a necessary consequence of this fact. The earth is essentially dry, but rain fills it with moisture. Then the sun and its own fire warm it and give rise to a quantity of wind both outside and inside it. This wind sometimes flows outwards in a single body, sometimes inwards, and sometimes it is divided. All these are necessary laws. Next

we must find out what body has the greatest motive force. This will certainly be the body that naturally moves farthest and is most violent. Now that which has the most rapid motion is necessarily the most violent; for its swiftness gives its impact the greatest force. Again, the rarest body, that which can most readily pass through every other body, is that which naturally moves farthest. Wind satisfies these conditions in the highest degree (fire only becomes flame and moves rapidly when wind accompanies it): so that not water nor earth is the cause of earthquakes but wind – that is, the inrush of the external evaporation into the earth.

Hence, since the evaporation generally follows in a continuous body in the direction in which it first started, and either all of it flows inwards or all outwards, most earthquakes and the greatest are accompanied by calm. It is true that some take place when a wind is blowing, but this presents no difficulty. We sometimes find several winds blowing simultaneously. If one of these enters the earth we get an earthquake attended by wind. Only these earthquakes are less severe because their source and cause is divided.

Again, most earthquakes and the severest occur at night or, if by day, about noon, that being generally the calmest part of the day. For when the sun exerts its full power (as it does about noon) it shuts the evaporation into the earth. Night, too, is calmer than day. The absence of the sun makes the evaporation return into the earth like a sort of ebb tide, corresponding to the outward flow; especially towards dawn, for the winds, as a rule, begin to blow then, and if their source changes about like the Euripus and flows inwards the quantity of wind in the earth is greater and a more violent earthquake results.

The severest earthquakes take place where the sea is full of currents or the earth spongy and cavernous: so they occur near

the Hellespont and in Achaea and Sicily, and those parts of Euboea which correspond to our description – where the sea is supposed to flow in channels below the earth. The hot springs, too, near Aedepsus are due to a cause of this kind. It is the confined character of these places that makes them so liable to earthquakes. A great and therefore violent wind is developed, which would naturally blow away from the earth: but the onrush of the sea in a great mass thrusts it back into the earth. The countries that are spongy below the surface are exposed to earthquakes because they have room for so much wind.

For the same reason earthquakes usually take place in spring and autumn and in times of wet and of drought – because these are the windiest seasons. Summer with its heat and winter with its frost cause calm: winter is too cold, summer too dry for winds to form. In time of drought the air is full of wind; drought is just the predominance of the dry over the moist evaporation. Again, excessive rain causes more of the evaporation to form in the earth. Then this secretion is shut up in a narrow compass and forced into a smaller space by the water that fills the cavities. Thus a great wind is compressed into a smaller space and so gets the upper hand, and then breaks out and beats against the earth and shakes it violently.

We must suppose the action of the wind in the earth to be analogous to the tremors and throbbings caused in us by the force of the wind contained in our bodies. Thus some earthquakes are a sort of tremor, others a sort of throbbing. Again, we must think of an earthquake as something like the tremor that often runs through the body after passing water as the wind returns inwards from without in one volume.

The force wind can have may be gathered not only from what happens in the air (where one might suppose that it owed its power to produce such effects to its volume), but also from what

is observed in animal bodies. Tetanus and spasms are motions of wind, and their force is such that the united efforts of many men do not succeed in overcoming the movements of the patients. We must suppose, then (to compare great things with small), that what happens in the earth is just like that. Our theory has been verified by actual observation in many places. It has been known to happen that an earthquake has continued until the wind that caused it burst through the earth into the air and appeared visibly like a hurricane. This happened lately near Heracleia in Pontus and some time past at the island Hiera, one of the group called the Aeolian islands. Here a portion of the earth swelled up and a lump like a mound rose with a noise: finally it burst, and a great wind came out of it and threw up live cinders and ashes which buried the neighbouring town of Lipara and reached some of the towns in Italy. The spot where this eruption occurred is still to be seen.

Indeed, this must be recognized as the cause of the fire that is generated in the earth: the air is first broken up in small particles and then the wind is beaten about and so catches fire.

A phenomenon in these islands affords further evidence of the fact that winds move below the surface of the earth. When a south wind is going to blow there is a premonitory indication: a sound is heard in the places from which the eruptions issue. This is because the sea is being pushed on from a distance and its advance thrusts back into the earth the wind that was issuing from it. The reason why there is a noise and no earthquake is that the underground spaces are so extensive in proportion to the quantity of the air that is being driven on that the wind slips away into the void beyond.

Again, our theory is supported by the facts that the sun appears hazy and is darkened in the absence of clouds, and that there is sometimes calm and sharp frost before earthquakes at sunrise.

The sun is necessarily obscured and darkened when the evaporation which dissolves and rarefies the air begins to withdraw into the earth. The calm, too, and the cold towards sunrise and dawn follow from the theory. The calm we have already explained. There must as a rule be calm because the wind flows back into the earth: again, it must be most marked before the more violent earthquakes, for when the wind is not part outside earth, part inside, but moves in a single body, its strength must be greater. The cold comes because the evaporation which is naturally and essentially hot enters the earth. (Wind is not recognized to be hot, because it sets the air in motion, and that is full of a quantity of cold vapour. It is the same with the breath we blow from our mouth: close by it is warm, as it is when we breathe out through the mouth, but there is so little of it that it is scarcely noticed, whereas at a distance it is cold for the same reason as wind.) Well, when this evaporation disappears into the earth the vaporous exhalation concentrates and causes cold in any place in which this disappearance occurs.

A sign which sometimes precedes earthquakes can be explained in the same way. Either by day or a little after sunset, in fine weather, a little, light, long-drawn cloud is seen, like a long very straight line. This is because the wind is leaving the air and dying down. Something analogous to this happens on the sea-shore. When the sea breaks in great waves the marks left on the sand are very thick and crooked, but when the sea is calm they are slight and straight (because the secretion is small). As the sea is to the shore so the wind is to the cloudy air; so, when the wind drops, this very straight and thin cloud is left, a sort of wave-mark in the air.

An earthquake sometimes coincides with an eclipse of the moon for the same reason. When the earth is on the point of being interposed, but the light and heat of the sun has not quite

vanished from the air but is dying away, the wind which causes the earthquake before the eclipse, turns off into the earth, and calm ensues. For there often are winds before eclipses: at nightfall if the eclipse is at midnight, and at midnight if the eclipse is at dawn. They are caused by the lessening of the warmth from the moon when its sphere approaches the point at which the eclipse is going to take place. So the influence which restrained and quieted the air weakens and the air moves again and a wind rises, and does so later, the later the eclipse.

A severe earthquake does not stop at once or after a single shock, but first the shocks go on, often for about forty days; after that, for one or even two years it gives premonitory indications in the same place. The severity of the earthquake is determined by the quantity of wind and the shape of the passages through which it flows. Where it is beaten back and cannot easily find its way out the shocks are most violent, and there it must remain in a cramped space like water that cannot escape. Any throbbing in the body does not cease suddenly or quickly, but by degrees according as the affection passes off. So here the agency which created the evaporation and gave it an impulse to motion clearly does not at once exhaust the whole of the material from which it forms the wind which we call an earthquake. So until the rest of this is exhausted the shocks must continue, though more gently, and they must go on until there is too little of the evaporation left to have any perceptible effect on the earth at all.

Subterranean noises, too, are due to the wind; sometimes they portend earthquakes but sometimes they have been heard without any earthquake following. Just as the air gives off various sounds when it is struck, so it does when it strikes other things; for striking involves being struck and so the two cases are the same. The sound precedes the shock because sound is

thinner and passes through things more readily than wind. But when the wind is too weak by reason of thinness to cause an earthquake the absence of a shock is due to its filtering through readily, though by striking hard and hollow masses of different shapes it makes various noises, so that the earth sometimes seems to 'bellow' as the portentmongers say.

Water has been known to burst out during an earthquake. But that does not make water the cause of the earthquake. The wind is the efficient cause whether it drives the water along the surface or up from below: just as winds are the causes of waves and not waves of winds. Else we might as well say that earth was the cause; for it is upset in an earthquake, just like water (for effusion is a form of upsetting). No, earth and water are material causes (being patients, not agents): the true cause is the wind.

The combination of a tidal wave with an earthquake is due to the presence of contrary winds. It occurs when the wind which is shaking the earth does not entirely succeed in driving off the sea which another wind is bringing on, but pushes it back and heaps it up in a great mass in one place. Given this situation it follows that when this wind gives way the whole body of the sea, driven on by the other wind, will burst out and overwhelm the land. This is what happened in Achaea. There a south wind was blowing, but outside a north wind; then there was a calm and the wind entered the earth, and then the tidal wave came on and simultaneously there was an earthquake. This was the more violent as the sea allowed no exit to the wind that had entered the earth, but shut it in. So in their struggle with one another the wind caused the earthquake, and the wave by its settling down the inundation.

Earthquakes are local and often affect a small district only; whereas winds are not local. Such phenomena are local when

the evaporations at a given place are joined by those from the next and unite; this, as we explained, is what happens when there is drought or excessive rain locally. Now earthquakes do come about in this way but winds do not. For earthquakes, rains, and droughts have their source and origin inside the earth, so that the sun is not equally able to direct all the evaporations in one direction. But on the evaporations in the air the sun has more influence so that, when once they have been given an impulse by its motion, which is determined by its various positions, they flow in one direction.

When the wind is present in sufficient quantity there is an earthquake. The shocks are horizontal like a tremor; except occasionally, in a few places, where they act vertically, upwards from below, like a throbbing. It is the vertical direction which makes this kind of earthquake so rare. The motive force does not easily accumulate in great quantity in the position required, since the surface of the earth secretes far more of the evaporation than its depths. Wherever an earthquake of this kind does occur a quantity of stones comes to the surface of the earth (as when you throw up things in a winnowing fan), as we see from Sipylus and the Phlegraean plain and the district in Liguria, which were devastated by this kind of earthquake.

Islands in the middle of the sea are less exposed to earthquakes than those near land. First, the volume of the sea cools the evaporations and overpowers them by its weight and so crushes them. Then, currents and not shocks are produced in the sea by the action of the winds. Again, it is so extensive that evaporations do not collect in it but issue from it, and these draw the evaporations from the earth after them. Islands near the continent really form part of it: the intervening sea is not enough to make any difference; but those in the open sea can only be shaken if the whole of the sea that surrounds them is shaken too.

We have now explained earthquakes, their nature and cause, and the most important of the circumstances attendant on their appearance.

9

Let us go on to explain lightning and thunder, and further whirlwind, fire-wind, and thunderbolts: for the cause of them all is the same.

As we have said, there are two kinds of exhalation, moist and dry, and the atmosphere contains them both potentially. It, as we have said before, condenses into cloud, and the density of the clouds is highest at their upper limit. (For they must be denser and colder on the side where the heat escapes to the upper region and leaves them. This explains why hurricanes and thunderbolts and all analogous phenomena move downwards in spite of the fact that everything hot has a natural tendency upwards. Just as the pips that we squeeze between our fingers are heavy but often jump upwards: so these things are necessarily squeezed out away from the densest part of the cloud.) Now the heat that escapes disperses to the up region. But if any of the dry exhalation is caught in the process as the air cools, it is squeezed out as the clouds contract, and collides in its rapid course with the neighbouring clouds, and the sound of this collision is what we call thunder. This collision is analogous, to compare small with great, to the sound we hear in a flame which men call the laughter or the threat of Hephaestus or of Hestia. This occurs when the wood dries and cracks and the exhalation rushes on the flame in a body. So in the clouds, the exhalation is projected and its impact on dense clouds causes thunder: the variety of the sound is due to the

irregularity of the clouds and the hollows that intervene where their density is interrupted. This then, is thunder, and this its cause.

It usually happens that the exhalation that is ejected is inflamed and burns with a thin and faint fire: this is what we call lightning, where we see as it were the exhalation coloured in the act of its ejection. It comes into existence after the collision and the thunder, though we see it earlier because sight is quicker than hearing. The rowing of triremes illustrates this: the oars are going back again before the sound of their striking the water reaches us.

However, there are some who maintain that there is actually fire in the clouds. Empedocles says that it consists of some of the sun's rays which are intercepted: Anaxagoras that it is part of the upper ether (which he calls fire) which has descended from above. Lightning, then, is the gleam of this fire, and thunder the hissing noise of its extinction in the cloud.

But this involves the view that lightning actually is prior to thunder and does not merely appear to be so. Again, this intercepting of the fire is impossible on either theory, but especially it is said to be drawn down from the upper ether. Some reason ought to be given why that which naturally ascends should descend, and why it should not always do so, but only when it is cloudy. When the sky is clear there is no lightning: to say that there is, is altogether wanton.

The view that the heat of the sun's rays intercepted in the clouds is the cause of these phenomena is equally unattractive: this, too, is a most careless explanation. Thunder, lightning, and the rest must have a separate and determinate cause assigned to them on which they ensue. But this theory does nothing of the sort. It is like supposing that water, snow, and hail existed all along and were produced when the time came and not

generated at all, as if the atmosphere brought each to hand out of its stock from time to time. They are concretions in the same way as thunder and lightning are discretions, so that if it is true of either that they are not generated but pre-exist, the same must be true of the other. Again, how can any distinction be made about the intercepting between this case and that of interception in denser substances such as water? Water, too, is heated by the sun and by fire: yet when it contracts again and grows cold and freezes no such ejection as they describe occurs, though it ought on their the. to take place on a proportionate scale. Boiling is due to the exhalation generated by fire: but it is impossible for it to exist in the water beforehand; and besides they call the noise 'hissing', not 'boiling'. But hissing is really boiling on a small scale: for when that which is brought into contact with moisture and is in process of being extinguished gets the better of it, then it boils and makes the noise in question. Some – Cleidemus is one of them – say that lightning is nothing objective but merely an appearance. They compare it to what happens when you strike the sea with a rod by night and the water is seen to shine. They say that the moisture in the cloud is beaten about in the same way, and that lightning is the appearance of brightness that ensues.

This theory is due to ignorance of the theory of reflection, which is the real cause of that phenomenon. The water appears to shine when struck because our sight is reflected from it to some bright object: hence the phenomenon occurs mainly by night: the appearance is not seen by day because the daylight is too in, tense and obscures it.

These are the theories of others about thunder and lightning: some maintaining that lightning is a reflection, the others that lightning is fire shining through the cloud and thunder its extinction, the fire not being generated in each case but existing beforehand. We say that the same stuff is wind on the earth,

and earthquake under it, and in the clouds thunder. The essential constituent of all these phenomena is the same: namely, the dry exhalation. If it flows in one direction it is wind, in another it causes earthquakes; in the clouds, when they are in a process of change and contract and condense into water, it is ejected and causes thunder and lightning and the other phenomena of the same nature.

So much for thunder and lightning.

Book III

1

Let us explain the remaining operations of this secretion in the same way as we have treated the rest. When this exhalation is secreted in small and scattered quantities and frequently, and is transitory, and its constitution rare, it gives rise to thunder and lightning. But if it is secreted in a body and is denser, that is, less rare, we get a hurricane. The fact that it issues in body explains its violence: it is due to the rapidity of the secretion. Now when this secretion issues in a great and continuous current the result corresponds to what we get when the opposite development takes place and rain and a quantity of water are produced. As far as the matter from which they are developed goes both sets of phenomena are the same. As soon as a stimulus to the development of either potentiality appears, that of which there is the greater quantity present in the cloud

is at once secreted from it, and there results either rain, or, if the other exhalation prevails, a hurricane.

Sometimes the exhalation in the cloud, when it is being secreted, collides with another under circumstances like those found when a wind is forced from an open into a narrow space in a gateway or a road. It often happens in such cases that the first part of the moving body is deflected because of the resistance due either to the narrowness or to a contrary current, and so the wind forms a circle and eddy. It is prevented from advancing in a straight line: at the same time it is pushed on from behind; so it is compelled to move sideways in the direction of least resistance. The same thing happens to the next part, and the next, and so on, till the series becomes one, that is, till a circle is formed: for if a figure is described by a single motion that figure must itself be one. This is how eddies are generated on the earth, and the case is the same in the clouds as far as the beginning of them goes. Only here (as in the case of the hurricane which shakes off the cloud without cessation and becomes a continuous wind) the cloud follows the exhalation unbroken, and the exhalation, failing to break away from the cloud because of its density, first moves in a circle for the reason given and then descends, because clouds are always densest on the side where the heat escapes. This phenomenon is called a whirlwind when it is colourless; and it is a sort of undigested hurricane. There is never a whirlwind when the weather is northerly, nor a hurricane when there is snow. The reason is that all these phenomena are ‘wind’, and wind is a dry and warm evaporation. Now frost and cold prevail over this principle and quench it at its birth: that they do prevail is clear or there could be no snow or northerly rain, since these occur when the cold does prevail.

So the whirlwind originates in the failure of an incipient hurricane to escape from its cloud: it is due to the resistance

which generates the eddy, and it consists in the spiral which descends to the earth and drags with it the cloud which it cannot shake off. It moves things by its wind in the direction in which it is blowing in a straight line, and whirls round by its circular motion and forcibly snatches up whatever it meets.

When the cloud burns as it is drawn downwards, that is, when the exhalation becomes rarer, it is called a fire-wind, for its fire colours the neighbouring air and inflames it.

When there is a great quantity of exhalation and it is rare and is squeezed out in the cloud itself we get a thunderbolt. If the exhalation is exceedingly rare this rareness prevents the thunderbolt from scorching and the poets call it ‘bright’: if the rareness is less it does scorch and they call it ‘smoky’. The former moves rapidly because of its rareness, and because of its rapidity passes through an object before setting fire to it or dwelling on it so as to blacken it: the slower one does blacken the object, but passes through it before it can actually burn it. Further, resisting substances are affected, unresisting ones are not. For instance, it has happened that the bronze of a shield has been melted while the woodwork remained intact because its texture was so loose that the exhalation filtered through without affecting it. So it has passed through clothes, too, without burning them, and has merely reduced them to shreds.

Such evidence is enough by itself to show that the exhalation is at work in all these cases, but we sometimes get direct evidence as well, as in the case of the conflagration of the temple at Ephesus which we lately witnessed. There independent sheets of flame left the main fire and were carried bodily in many directions. Now that smoke is exhalation and that smoke burns is certain, and has been stated in another place before; but when the flame moves bodily, then we have ocular proof that smoke is exhalation. On this occasion what is seen in small

fires appeared on a much larger scale because of the quantity of matter that was burning. The beams which were the source of the exhalation split, and a quantity of it rushed in a body from the place from which it issued forth and went up in a blaze: so that the flame was actually seen moving through the air away and falling on the houses. For we must recognize that exhalation accompanies and precedes thunderbolts though it is colourless and so invisible. Hence, where the thunderbolt is going to strike, the object moves before it is struck, showing that the exhalation leads the way and falls on the object first. Thunder, too, splits things not by its noise but because the exhalation that strikes the object and that which makes the noise are ejected simultaneously. This exhalation splits the thing it strikes but does not scorch it at all.

We have now explained thunder and lightning and hurricane, and further firewinds, whirlwinds, and thunderbolts, and shown that they are all of them forms of the same thing and wherein they all differ.

2

Let us now explain the nature and cause of halo, rainbow, mock suns, and rods, since the same account applies to them all.

We must first describe the phenomena and the circumstances in which each of them occurs. The halo often appears as a complete circle: it is seen round the sun and the moon and bright stars, by night as well as by day, and at midday or in the afternoon, more rarely about sunrise or sunset.

The rainbow never forms a full circle, nor any segment greater than a semicircle. At sunset and sunrise the circle is smallest

and the segment largest: as the sun rises higher the circle is larger and the segment smaller. After the autumn equinox in the shorter days it is seen at every hour of the day, in the summer not about midday. There are never more than two rainbows at one time. Each of them is three-coloured; the colours are the same in both and their number is the same, but in the outer rainbow they are fainter and their position is reversed. In the inner rainbow the first and largest band is red; in the outer rainbow the band that is nearest to this one and smallest is of the same colour: the other bands correspond on the same principle. These are almost the only colours which painters cannot manufacture: for there are colours which they create by mixing, but no mixing will give red, green, or purple. These are the colours of the rainbow, though between the red and the green an orange colour is often seen.

Mock suns and rods are always seen by the side of the sun, not above or below it nor in the opposite quarter of the sky. They are not seen at night but always in the neighbourhood of the sun, either as it is rising or setting but more commonly towards sunset. They have scarcely ever appeared when the sun was on the meridian, though this once happened in Bosporus where two mock suns rose with the sun and followed it all through the day till sunset.

These are the facts about each of these phenomena: the cause of them all is the same, for they are all reflections. But they are different varieties, and are distinguished by the surface from which and the way in which the reflection to the sun or some other bright object takes place.

The rainbow is seen by day, and it was formerly thought that it never appeared by night as a moon rainbow. This opinion was due to the rarity of the occurrence: it was not observed, for though it does happen it does so rarely. The reason is that the

colours are not so easy to see in the dark and that many other conditions must coincide, and all that in a single day in the month. For if there is to be one it must be at full moon, and then as the moon is either rising or setting. So we have only met with two instances of a moon rainbow in more than fifty years.

We must accept from the theory of optics the fact that sight is reflected from air and any object with a smooth surface just as it is from water; also that in some mirrors the forms of things are reflected, in others only their colours. Of the latter kind are those mirrors which are so small as to be indivisible for sense. It is impossible that the figure of a thing should be reflected in them, for if it is the mirror will be sensibly divisible since divisibility is involved in the notion of figure. But since something must be reflected in them and figure cannot be, it remains that colour alone should be reflected. The colour of a bright object sometimes appears bright in the reflection, but it sometimes, either owing to the admixture of the colour of the mirror or to weakness of sight, gives rise to the appearance of another colour.

However, we must accept the account we have given of these things in the theory of sensation, and take some things for granted while we explain others.

3

Let us begin by explaining the shape of the halo; why it is a circle and why it appears round the sun or the moon or one of the other stars: the explanation being in all these cases the same.

Sight is reflected in this way when air and vapour are condensed into a cloud and the condensed matter is uniform and consists of small parts. Hence in itself it is a sign of rain, but if it fades away, of fine weather, if it is broken up, of wind. For if it does not fade away and is not broken up but is allowed to attain its normal state, it is naturally a sign of rain since it shows that a process of condensation is proceeding which must, when it is carried to an end, result in rain. For the same reason these haloes are the darkest. It is a sign of wind when it is broken up because its breaking up is due to a wind which exists there but has not reached us. This view finds support in the fact that the wind blows from the quarter in which the main division appears in the halo. Its fading away is a sign of fine weather because if the air is not yet in a state to get the better of the heat it contains and proceed to condense into water, this shows that the moist vapour has not yet separated from the dry and firelike exhalation: and this is the cause of fine weather.

So much for the atmospheric conditions under which the reflection takes place. The reflection is from the mist that forms round the sun or the moon, and that is why the halo is not seen opposite the sun like the rainbow.

Since the reflection takes place in the same way from every point the result is necessarily a circle or a segment of a circle: for if the lines start from the same point and end at the same point and are equal, the points where they form an angle will always lie on a circle.

Let AGB and AZB and ADB be lines each of which goes from the point A to the point B and forms an angle. Let the lines AG, AZ, AD be equal and those at B, GB, ZB, DB equal too. (See diagram.)

Draw the line AEB. Then the triangles are equal; for their base AEB is equal. Draw perpendiculars to AEB from the angles; GE from G, ZE from Z, DE from D. Then these perpendiculars are

equal, being in equal triangles. And they are all in one plane, being all at right angles to AEB and meeting at a single point E. So if you draw the line it will be a circle and E its centre. Now B is the sun, A the eye, and the circumference passing through the points GZD the cloud from which the line of sight is reflected to the sun.

The mirrors must be thought of as contiguous: each of them is too small to be visible, but their contiguity makes the whole made up of them all to seem one. The bright band is the sun, which is seen as a circle, appearing successively in each of the mirrors as a point indivisible to sense. The band of cloud next to it is black, its colour being intensified by contrast with the brightness of the halo. The halo is formed rather near the earth because that is calmer: for where there is wind it is clear that no halo can maintain its position.

Haloes are commoner round the moon because the greater heat of the sun dissolves the condensations of the air more rapidly.

Haloes are formed round stars for the same reasons, but they are not prognostic in the same way because the condensation they imply is so insignificant as to be barren.

4

We have already stated that the rainbow is a reflection: we have now to explain what sort of reflection it is, to describe its various concomitants, and to assign their causes.

Sight is reflected from all smooth surfaces, such as are air and water among others. Air must be condensed if it is to act as a mirror, though it often gives a reflection even uncondensed

when the sight is weak. Such was the case of a man whose sight was faint and indistinct. He always saw an image in front of him and facing him as he walked. This was because his sight was reflected back to him. Its morbid condition made it so weak and delicate that the air close by acted as a mirror, just as distant and condensed air normally does, and his sight could not push it back. So promontories in the sea 'loom' when there is a south-east wind, and everything seems bigger, and in a mist, too, things seem bigger: so, too, the sun and the stars seem bigger when rising and setting than on the meridian. But things are best reflected from water, and even in process of formation it is a better mirror than air, for each of the particles, the union of which constitutes a raindrop, is necessarily a better mirror than mist. Now it is obvious and has already been stated that a mirror of this kind renders the colour of an object only, but not its shape. Hence it follows that when it is on the point of raining and the air in the clouds is in process of forming into raindrops but the rain is not yet actually there, if the sun is opposite, or any other object bright enough to make the cloud a mirror and cause the sight to be reflected to the object then the reflection must render the colour of the object without its shape. Since each of the mirrors is so small as to be invisible and what we see is the continuous magnitude made up of them all, the reflection necessarily gives us a continuous magnitude made up of one colour; each of the mirrors contributing the same colour to the whole. We may deduce that since these conditions are realizable there will be an appearance due to reflection whenever the sun and the cloud are related in the way described and we are between them. But these are just the conditions under which the rainbow appears. So it is clear that the rainbow is a reflection of sight to the sun.

So the rainbow always appears opposite the sun whereas the halo is round it. They are both reflections, but the rainbow is distinguished by the variety of its colours. The reflection in the

one case is from water which is dark and from a distance; in the other from air which is nearer and lighter in colour. White light through a dark medium or on a dark surface (it makes no difference) looks red. We know how red the flame of green wood is: this is because so much smoke is mixed with the bright white firelight: so, too, the sun appears red through smoke and mist. That is why in the rainbow reflection the outer circumference is red (the reflection being from small particles of water), but not in the case of the halo. The other colours shall be explained later. Again, a condensation of this kind cannot persist in the neighbourhood of the sun: it must either turn to rain or be dissolved, but opposite to the sun there is an interval during which the water is formed. If there were not this distinction haloes would be coloured like the rainbow. Actually no complete or circular halo presents this colour, only small and fragmentary appearances called 'rods'. But if a haze due to water or any other dark substance formed there we should have had, as we maintain, a complete rainbow like that which we do find lamps. A rainbow appears round these in winter, generally with southerly winds. Persons whose eyes are moist see it most clearly because their sight is weak and easily reflected. It is due to the moistness of the air and the soot which the flame gives off and which mixes with the air and makes it a mirror, and to the blackness which that mirror derives from the smoky nature of the soot. The light of the lamp appears as a circle which is not white but purple. It shows the colours of the rainbow; but because the sight that is reflected is too weak and the mirror too dark, red is absent. The rainbow that is seen when oars are raised out of the sea involves the same relative positions as that in the sky, but its colour is more like that round the lamps, being purple rather than red. The reflection is from very small particles continuous with one another, and in this case the particles are fully formed water. We get a rainbow, too, if a man sprinkles fine drops in a room turned to the sun so that the sun

is shining in part of the room and throwing a shadow in the rest. Then if one man sprinkles in the room, another, standing outside, sees a rainbow where the sun's rays cease and make the shadow. Its nature and colour is like that from the oars and its cause is the same, for the sprinkling hand corresponds to the oar.

That the colours of the rainbow are those we described and how the other colours come to appear in it will be clear from the following considerations. We must recognize, as we have said, and lay down: first, that white colour on a black surface or seen through a black medium gives red; second, that sight when strained to a distance becomes weaker and less; third, that black is in a sort the negation of sight: an object is black because sight fails; so everything at a distance looks blacker, because sight does not reach it. The theory of these matters belongs to the account of the senses, which are the proper subjects of such an inquiry; we need only state about them what is necessary for us. At all events, that is the reason why distant objects and objects seen in a mirror look darker and smaller and smoother, why the reflection of clouds in water is darker than the clouds themselves. This latter is clearly the case: the reflection diminishes the sight that reaches them. It makes no difference whether the change is in the object seen or. in the sight, the result being in either case the same. The following fact further is worth noticing. When there is a cloud near the sun and we look at it does not look coloured at all but white, but when we look at the same cloud in water it shows a trace of rainbow colouring. Clearly, then, when sight is reflected it is weakened and, as it makes dark look darker, so it makes white look less white, changing it and bringing it nearer to black. When the sight is relatively strong the change is to red; the next stage is green, and a further degree of weakness gives violet. No further change is visible, but three completes the series of colours (as we find three does in most other things), and the change into

the rest is imperceptible to sense. Hence also the rainbow appears with three colours; this is true of each of the two, but in a contrary way. The outer band of the primary rainbow is red: for the largest band reflects most sight to the sun, and the outer band is largest. The middle band and the third go on the same principle. So if the principles we laid down about the appearance of colours are true the rainbow necessarily has three colours, and these three and no others. The appearance of yellow is due to contrast, for the red is whitened by its juxtaposition with green. We can see this from the fact that the rainbow is purest when the cloud is blackest; and then the red shows most yellow. (Yellow in the rainbow comes between red and green.) So the whole of the red shows white by contrast with the blackness of the cloud around: for it is white compared to the cloud and the green. Again, when the rainbow is fading away and the red is dissolving, the white cloud is brought into contact with the green and becomes yellow. But the moon rainbow affords the best instance of this colour contrast. It looks quite white: this is because it appears on the dark cloud and at night. So, just as fire is intensified by added fire, black beside black makes that which is in some degree white look quite white. Bright dyes too show the effect of contrast. In woven and embroidered stuffs the appearance of colours is profoundly affected by their juxtaposition with one another (purple, for instance, appears different on white and on black wool), and also by differences of illumination. Thus embroiderers say that they often make mistakes in their colours when they work by lamplight, and use the wrong ones.

We have now shown why the rainbow has three colours and that these are its only colours. The same cause explains the double rainbow and the faintness of the colours in the outer one and their inverted order. When sight is strained to a great distance the appearance of the distant object is affected in a certain way: and the same thing holds good here. So the

reflection from the outer rainbow is weaker because it takes place from a greater distance and less of it reaches the sun, and so the colours seen are fainter. Their order is reversed because more reflection reaches the sun from the smaller, inner band. For that reflection is nearer to our sight which is reflected from the band which is nearest to the primary rainbow. Now the smallest band in the outer rainbow is that which is nearest, and so it will be red; and the second and the third will follow the same principle. Let B be the outer rainbow, A the inner one; let R stand for the red colour, G for green, V for violet; yellow appears at the point Y. Three rainbows or more are not found because even the second is fainter, so that the third reflection can have no strength whatever and cannot reach the sun at all. (See diagram.)

5

The rainbow can never be a circle nor a segment of a circle greater than a semicircle. The consideration of the diagram will prove this and the other properties of the rainbow. (See diagram.)

Let A be a hemisphere resting on the circle of the horizon, let its centre be K and let H be another point appearing on the horizon. Then, if the lines that fall in a cone from K have HK as their axis, and, K and M being joined, the lines KM are reflected from the hemisphere to H over the greater angle, the lines from K will fall on the circumference of a circle. If the reflection takes place when the luminous body is rising or setting the segment of the circle above the earth which is cut off by the horizon will be a semi-circle; if the luminous body is above the horizon it will always be less than a semicircle, and it will be smallest

when the luminous body culminates. First let the luminous body be appearing on the horizon at the point H, and let KM be reflected to H, and let the plane in which A is, determined by the triangle HKM, be produced. Then the section of the sphere will be a great circle. Let it be A (for it makes no difference which of the planes passing through the line HK and determined by the triangle KMH is produced). Now the lines drawn from H and K to a point on the semicircle A are in a certain ratio to one another, and no lines drawn from the same points to another point on that semicircle can have the same ratio. For since both the points H and K and the line KH are given, the line MH will be given too; consequently the ratio of the line MH to the line MK will be given too. So M will touch a given circumference. Let this be NM. Then the intersection of the circumferences is given, and the same ratio cannot hold between lines in the same plane drawn from the same points to any other circumference but MN.

Draw a line DB outside of the figure and divide it so that D:B=MH:MK. But MH is greater than MK since the reflection of the cone is over the greater angle (for it subtends the greater angle of the triangle KMH). Therefore D is greater than B. Then add to B a line Z such that B+Z:D=D:B. Then make another line having the same ratio to B as KH has to Z, and join MI.

Then I is the pole of the circle on which the lines from K fall. For the ratio of D to IM is the same as that of Z to KH and of B to KI. If not, let D be in the same ratio to a line indifferently lesser or greater than IM, and let this line be IP. Then HK and KI and IP will have the same ratios to one another as Z, B, and D. But the ratios between Z, B, and D were such that Z+B:D=D: B. Therefore IH:IP=IP:IK. Now, if the points K, H be joined with the point P by the lines HP, KP, these lines will be to one another as IH is to IP, for the sides of the triangles HIP, KPI about the angle I are homologous. Therefore, HP too will be to KP as HI is to IP. But

this is also the ratio of MH to MK, for the ratio both of HI to IP and of MH to MK is the same as that of D to B. Therefore, from the points H, K there will have been drawn lines with the same ratio to one another, not only to the circumference MN but to another point as well, which is impossible. Since then D cannot bear that ratio to any line either lesser or greater than IM (the proof being in either case the same), it follows that it must stand in that ratio to MI itself. Therefore as MI is to IK so IH will be to MI and finally MH to MK.

If, then, a circle be described with I as pole at the distance MI it will touch all the angles which the lines from H and K make by their reflection. If not, it can be shown, as before, that lines drawn to different points in the semicircle will have the same ratio to one another, which was impossible. If, then, the semicircle A be revolved about the diameter HKI, the lines reflected from the points H, K at the point M will have the same ratio, and will make the angle KMH equal, in every plane. Further, the angle which HM and MI make with HI will always be the same. So there are a number of triangles on HI and KI equal to the triangles HMI and KMI. Their perpendiculars will fall on HI at the same point and will be equal. Let O be the point on which they fall. Then O is the centre of the circle, half of which, MN, is cut off by the horizon. (See diagram.)

Next let the horizon be ABG but let H have risen above the horizon. Let the axis now be HI. The proof will be the same for the rest as before, but the pole I of the circle will be below the horizon AG since the point H has risen above the horizon. But the pole, and the centre of the circle, and the centre of that circle (namely HI) which now determines the position of the sun are on the same line. But since KH lies above the diameter AG, the centre will be at O on the line KI below the plane of the circle AG determined the position of the sun before. So the segment YX which is above the horizon will be less than a

semicircle. For YXM was a semicircle and it has now been cut off by the horizon AG. So part of it, YM, will be invisible when the sun has risen above the horizon, and the segment visible will be smallest when the sun is on the meridian; for the higher H is the lower the pole and the centre of the circle will be.

In the shorter days after the autumn equinox there may be a rainbow at any time of the day, but in the longer days from the spring to the autumn equinox there cannot be a rainbow about midday. The reason for this is that when the sun is north of the equator the visible arcs of its course are all greater than a semicircle, and go on increasing, while the invisible arc is small, but when the sun is south of the equator the visible arc is small and the invisible arc great, and the farther the sun moves south of the equator the greater is the invisible arc. Consequently, in the days near the summer solstice, the size of the visible arc is such that before the point H reaches the middle of that arc, that is its point of culmination, the point is well below the horizon; the reason for this being the great size of the visible arc, and the consequent distance of the point of culmination from the earth. But in the days near the winter solstice the visible arcs are small, and the contrary is necessarily the case: for the sun is on the meridian before the point H has risen far.

6

Mock suns, and rods too, are due to the causes we have described. A mock sun is caused by the reflection of sight to the sun. Rods are seen when sight reaches the sun under circumstances like those which we described, when there are clouds near the sun and sight is reflected from some liquid surface to the cloud. Here the clouds themselves are colourless

when you look at them directly, but in the water they are full of rods. The only difference is that in this latter case the colour of the cloud seems to reside in the water, but in the case of rods on the cloud itself. Rods appear when the composition of the cloud is uneven, dense in part and in part rare, and more and less watery in different parts. Then the sight is reflected to the sun: the mirrors are too small for the shape of the sun to appear, but, the bright white light of the sun, to which the sight is reflected, being seen on the uneven mirror, its colour appears partly red, partly green or yellow. It makes no difference whether sight passes through or is reflected from a medium of that kind; the colour is the same in both cases; if it is red in the first case it must be the same in the other.

Rods then are occasioned by the unevenness of the mirror – as regards colour, not form. The mock sun, on the contrary, appears when the air is very uniform, and of the same density throughout. This is why it is white: the uniform character of the mirror gives the reflection in it a single colour, while the fact that the sight is reflected in a body and is thrown on the sun all together by the mist, which is dense and watery though not yet quite water, causes the sun's true colour to appear just as it does when the reflection is from the dense, smooth surface of copper. So the sun's colour being white, the mock sun is white too. This, too, is the reason why the mock sun is a surer sign of rain than the rods; it indicates, more than they do, that the air is ripe for the production of water. Further a mock sun to the south is a surer sign of rain than one to the north, for the air in the south is readier to turn into water than that in the north.

Mock suns and rods are found, as we stated, about sunset and sunrise, not above the sun nor below it, but beside it. They are not found very close to the sun, nor very far from it, for the sun dissolves the cloud if it is near, but if it is far off the reflection cannot take place, since sight weakens when it is reflected from

a small mirror to a very distant object. (This is why a halo is never found opposite to the sun.) If the cloud is above the sun and close to it the sun will dissolve it; if it is above the sun but at a distance the sight is too weak for the reflection to take place, and so it will not reach the sun. But at the side of the sun, it is possible for the mirror to be at such an interval that the sun does not dissolve the cloud, and yet sight reaches it undiminished because it moves close to the earth and is not dissipated in the immensity of space. It cannot subsist below the sun because close to the earth the sun's rays would dissolve it, but if it were high up and the sun in the middle of the heavens, sight would be dissipated. Indeed, even by the side of the sun, it is not found when the sun is in the middle of the sky, for then the line of vision is not close to the earth, and so but little sight reaches the mirror and the reflection from it is altogether feeble.

Some account has now been given of the effects of the secretion above the surface of the earth; we must go on to describe its operations below, when it is shut up in the parts of the earth.

Just as its twofold nature gives rise to various effects in the upper region, so here it causes two varieties of bodies. We maintain that there are two exhalations, one vaporous the other smoky, and there correspond two kinds of bodies that originate in the earth, 'fossiles' and metals. The heat of the dry exhalation is the cause of all 'fossiles'. Such are the kinds of stones that cannot be melted, and realgar, and ochre, and ruddle, and sulphur, and the other things of that kind, most 'fossiles' being either coloured lye or, like cinnabar, a stone compounded of it. The vaporous exhalation is the cause of all metals, those bodies which are either fusible or malleable such as iron, copper, gold. All these originate from the imprisonment of the vaporous exhalation in the earth, and especially in stones. Their dryness compresses it, and it congeals just as dew or hoar-frost does

when it has been separated off, though in the present case the metals are generated before that segregation occurs. Hence, they are water in a sense, and in a sense not. Their matter was that which might have become water, but it can no longer do so: nor are they, like savours, due to a qualitative change in actual water. Copper and gold are not formed like that, but in every case the evaporation congealed before water was formed. Hence, they all (except gold) are affected by fire, and they possess an admixture of earth; for they still contain the dry exhalation.

This is the general theory of all these bodies, but we must take up each kind of them and discuss it separately.

Book IV

1

We have explained that the qualities that constitute the elements are four, and that their combinations determine the number of the elements to be four.

Two of the qualities, the hot and the cold, are active; two, the dry and the moist, passive. We can satisfy ourselves of this by looking at instances. In every case heat and cold determine, conjoin, and change things of the same kind and things of different kinds, moistening, drying, hardening, and softening them. Things dry and moist, on the other hand, both in isolation

and when present together in the same body are the subjects of that determination and of the other affections enumerated. The account we give of the qualities when we define their character shows this too. Hot and cold we describe as active, for ‘congregating’ is essentially a species of ‘being active’: moist and dry are passive, for it is in virtue of its being acted upon in a certain way that a thing is said to be ‘easy to determine’ or ‘difficult to determine’. So it is clear that some of the qualities are active and some passive.

Next we must describe the operations of the active qualities and the forms taken by the passive. First of all, true becoming, that is, natural change, is always the work of these powers and so is the corresponding natural destruction; and this becoming and this destruction are found in plants and animals and their parts. True natural becoming is a change introduced by these powers into the matter underlying a given thing when they are in a certain ratio to that matter, which is the passive qualities we have mentioned. When the hot and the cold are masters of the matter they generate a thing: if they are not, and the failure is partial, the object is imperfectly boiled or otherwise unconcocted. But the strictest general opposite of true becoming is putrefaction. All natural destruction is on the way to it, as are, for instance, growing old or growing dry. Putrescence is the end of all these things, that is of all natural objects, except such as are destroyed by violence: you can burn, for instance, flesh, bone, or anything else, but the natural course of their destruction ends in putrefaction. Hence things that putrefy begin by being moist and end by being dry. For the moist and the dry were their matter, and the operation of the active qualities caused the dry to be determined by the moist.

Destruction supervenes when the determined gets the better of the determining by the help of the environment (though in a special sense the word putrefaction is applied to partial

destruction, when a thing's nature is perverted). Hence everything, except fire, is liable to putrefy; for earth, water, and air putrefy, being all of them matter relatively to fire. The definition of putrefaction is: the destruction of the peculiar and natural heat in any moist subject by external heat, that is, by the heat of the environment. So since lack of heat is the ground of this affection and everything in as far as it lacks heat is cold, both heat and cold will be the causes of putrefaction, which will be due indifferently to cold in the putrefying subject or to heat in the environment.

This explains why everything that putrefies grows drier and ends by becoming earth or dung. The subject's own heat departs and causes the natural moisture to evaporate with it, and then there is nothing left to draw in moisture, for it is a thing's peculiar heat that attracts moisture and draws it in. Again, putrefaction takes place less in cold that in hot seasons, for in winter the surrounding air and water contain but little heat and it has no power, but in summer there is more. Again, what is frozen does not putrefy, for its cold is greater that the heat of the air and so is not mastered, whereas what affects a thing does master it. Nor does that which is boiling or hot putrefy, for the heat in the air being less than that in the object does not prevail over it or set up any change. So too anything that is flowing or in motion is less apt to putrefy than a thing at rest, for the motion set up by the heat in the air is weaker than that pre-existing in the object, and so it causes no change. For the same reason a great quantity of a thing putrefies less readily than a little, for the greater quantity contains too much proper fire and cold for the corresponding qualities in the environment to get the better of. Hence, the sea putrefies quickly when broken up into parts, but not as a whole; and all other waters likewise. Animals too are generated in putrefying bodies, because the heat that has been secreted, being natural, organizes the particles secreted with it.

So much for the nature of becoming and of destruction.

2

We must now describe the next kinds of processes which the qualities already mentioned set up in actually existing natural objects as matter.

Of these concoction is due to heat; its species are ripening, boiling, broiling. Inconcoction is due to cold and its species are rawness, imperfect boiling, imperfect broiling. (We must recognize that the things are not properly denoted by these words: the various classes of similar objects have no names universally applicable to them; consequently we must think of the species enumerated as being not what those words denote but something like it.) Let us say what each of them is. Concoction is a process in which the natural and proper heat of an object perfects the corresponding passive qualities, which are the proper matter of any given object. For when concoction has taken place we say that a thing has been perfected and has come to be itself. It is the proper heat of a thing that sets up this perfecting, though external influences may contribute in some degrees to its fulfilment. Baths, for instance, and other things of the kind contribute to the digestion of food, but the primary cause is the proper heat of the body. In some cases of concoction the end of the process is the nature of the thing – nature, that is, in the sense of the formal cause and essence. In other cases it leads to some presupposed state which is attained when the moisture has acquired certain properties or a certain magnitude in the process of being broiled or boiled or of putrefying, or however else it is being heated. This state is the end, for when it has been reached the thing has some use and

we say that concoction has taken place. Must is an instance of this, and the matter in boils when it becomes purulent, and tears when they become rheum, and so with the rest.

Concoction ensues whenever the matter, the moisture, is mastered. For the matter is what is determined by the heat connatural to the object, and as long as the ratio between them exists in it a thing maintains its nature. Hence things like the liquid and solid excreta and ejecta in general are signs of health, and concoction is said to have taken place in them, for they show that the proper heat has got the better of the indeterminate matter.

Things that undergo a process of concoction necessarily become thicker and hotter, for the action of heat is to make things more compact, thicker, and drier.

This then is the nature of concoction: but inconcoction is an imperfect state due to lack of proper heat, that is, to cold. That of which the imperfect state is, is the corresponding passive qualities which are the natural matter of anything.

So much for the definition of concoction and inconcoction.

3

Ripening is a sort of concoction; for we call it ripening when there is a concoction of the nutriment in fruit. And since concoction is a sort of perfecting, the process of ripening is perfect when the seeds in fruit are able to reproduce the fruit in which they are found; for in all other cases as well this is what we mean by 'perfect'. This is what 'ripening' means when the word is applied to fruit. However, many other things that have

undergone concoction are said to be 'ripe', the general character of the process being the same, though the word is applied by an extension of meaning. The reason for this extension is, as we explained before, that the various modes in which natural heat and cold perfect the matter they determine have not special names appropriated to them. In the case of boils and phlegm, and the like, the process of ripening is the concoction of the moisture in them by their natural heat, for only that which gets the better of matter can determine it. So everything that ripens is condensed from a spirituous into a watery state, and from a watery into an earthy state, and in general from being rare becomes dense. In this process the nature of the thing that is ripening incorporates some of the matter in itself, and some it rejects. So much for the definition of ripening.

Rawness is its opposite and is therefore an imperfect concoction of the nutriment in the fruit, namely, of the undetermined moisture. Consequently a raw thing is either spirituous or watery or contains both spirit and water. Ripening being a kind of perfecting, rawness will be an imperfect state, and this state is due to a lack of natural heat and its disproportion to the moisture that is undergoing the process of ripening. (Nothing moist ripens without the admixture of some dry matter: water alone of liquids does not thicken.) This disproportion may be due either to defect of heat or to excess of the matter to be determined: hence the juice of raw things is thin, cold rather than hot, and unfit for food or drink. Rawness, like ripening, is used to denote a variety of states. Thus the liquid and solid excreta and catarrhs are called raw for the same reason, for in every case the word is applied to things because their heat has not got the mastery in them and compacted them. If we go further, brick is called raw and so is milk and many other things too when they are such as to admit of being changed and compacted by heat but have remained unaffected. Hence, while we speak of 'boiled' water, we cannot

speak of raw water, since it does not thicken. We have now defined ripening and rawness and assigned their causes.

Boiling is, in general, a concoction by moist heat of the indeterminate matter contained in the moisture of the thing boiled, and the word is strictly applicable only to things boiled in the way of cooking. The indeterminate matter, as we said, will be either spirituous or watery. The cause of the concoction is the fire contained in the moisture; for what is cooked in a frying-pan is broiled: it is the heat outside that affects it and, as for the moisture in which it is contained, it dries this up and draws it into itself. But a thing that is being boiled behaves in the opposite way: the moisture contained in it is drawn out of it by the heat in the liquid outside. Hence boiled meats are drier than broiled; for, in boiling, things do not draw the moisture into themselves, since the external heat gets the better of the internal: if the internal heat had got the better it would have drawn the moisture to itself. Not every body admits of the process of boiling: if there is no moisture in it, it does not (for instance, stones), nor does it if there is moisture in it but the density of the body is too great for it to be mastered, as in the case of wood. But only those bodies can be boiled that contain moisture which can be acted on by the heat contained in the liquid outside. It is true that gold and wood and many other things are said to be 'boiled': but this is a stretch of the meaning of the word, though the kind of thing intended is the same, the reason for the usage being that the various cases have no names appropriated to them. Liquids too, like milk and must, are said to undergo a process of 'boiling' when the external fire that surrounds and heats them changes the savour in the liquid into a given form, the process being thus in a way like what we have called boiling.

The end of the things that undergo boiling, or indeed any form of concoction, is not always the same: some are meant to be

eaten, some drunk, and some are intended for other uses; for instance dyes, too, are said to be ‘boiled’.

All those things then admit of ‘boiling’ which can grow denser, smaller, or heavier; also those which do that with a part of themselves and with a part do the opposite, dividing in such a way that one portion thickens while the other grows thinner, like milk when it divides into whey and curd. Oil by itself is affected in none of these ways, and therefore cannot be said to admit of ‘boiling’. Such then is the pfcies of concoction known as ‘boiling’, and the process is the same in an artificial and in a natural instrument, for the cause will be the same in every case.

Imperfect boiling is the form of inconcoction opposed to boiling. Now the opposite of boiling properly so called is an inconcoction of the undetermined matter in a body due to lack of heat in the surrounding liquid. (Lack of heat implies, as we have pointed out, the presence of cold.) The motion which causes imperfect boiling is different from that which causes boiling, for the heat which operates the concoction is driven out. The lack of heat is due either to the amount of cold in the liquid or to the quantity of moisture in the object undergoing the process of boiling. Where either of these conditions is realized the heat in the surrounding liquid is too great to have no effect at all, but too small to carry out the process of concocting uniformly and thoroughly. Hence things are harder when they are imperfectly boiled than when they are boiled, and the moisture in them more distinct from the solid parts. So much for the definition and causes of boiling and imperfect boiling.

Broiling is concoction by dry foreign heat. Hence if a man were to boil a thing but the change and concoction in it were due, not to the heat of the liquid but to that of the fire, the thing will have been broiled and not boiled when the process has been

carried to completion: if the process has gone too far we use the word 'scorched' to describe it. If the process leaves the thing drier at the end the agent has been dry heat. Hence the outside is drier than the inside, the opposite being true of things boiled. Where the process is artificial, broiling is more difficult than boiling, for it is difficult to heat the inside and the outside uniformly, since the parts nearer to the fire are the first to get dry and consequently get more intensely dry. In this way the outer pores contract and the moisture in the thing cannot be secreted but is shut in by the closing of the pores. Now broiling and boiling are artificial processes, but the same general kind of thing, as we said, is found in nature too. The affections produced are similar though they lack a name; for art imitates nature. For instance, the concoction of food in the body is like boiling, for it takes place in a hot and moist medium and the agent is the heat of the body. So, too, certain forms of indigestion are like imperfect boiling. And it is not true that animals are generated in the concoction of food, as some say. Really they are generated in the excretion which putrefies in the lower belly, and they ascend afterwards. For concoction goes on in the upper belly but the excretion putrefies in the lower: the reason for this has been explained elsewhere.

We have seen that the opposite of boiling is imperfect boiling: now there is something correspondingly opposed to the species of concoction called broiling, but it is more difficult to find a name for it. It would be the kind of thing that would happen if there were imperfect broiling instead of broiling proper through lack of heat due to deficiency in the external fire or to the quantity of water in the thing undergoing the process. For then we should get too much heat for no effect to be produced, but too little for concoction to take place.

We have now explained concoction and inconcoction, ripening and rawness, boiling and broiling, and their opposites.

4

We must now describe the forms taken by the passive qualities the moist and the dry. The elements of bodies, that is, the passive ones, are the moist and the dry; the bodies themselves are compounded of them and whichever predominates determines the nature of the body; thus some bodies partake more of the dry, others of the moist. All the forms to be described will exist either actually, or potentially and in their opposite: for instance, there is actual melting and on the other hand that which admits of being melted.

Since the moist is easily determined and the dry determined with difficulty, their relation to one another is like that of a dish and its condiments. The moist is what makes the dry determinable, and each serves as a sort of glue to the other – as Empedocles said in his poem on Nature, 'glueing meal together by means of water.' Thus the determined body involves them both. Of the elements earth is especially representative of the dry, water of the moist, and therefore all determinate bodies in our world involve earth and water. Every body shows the quality of that element which predominates in it. It is because earth and water are the material elements of all bodies that animals live in them alone and not in air or fire.

Of the qualities of bodies hardness and softness are those which must primarily belong to a determined thing, for anything made up of the dry and the moist is necessarily either hard or soft. Hard is that the surface of which does not yield into itself; soft that which does yield but not by interchange of place: water, for instance, is not soft, for its surface does not yield to pressure or sink in but there is an interchange of place.

Those things are absolutely hard and soft which satisfy the definition absolutely, and those things relatively so which do so compared with another thing. Now relatively to one another hard and soft are indefinable, because it is a matter of degree, but since all the objects of sense are determined by reference to the faculty of sense it is clearly the relation to touch which determines that which is hard and soft absolutely, and touch is that which we use as a standard or mean. So we call that which exceeds it hard and that which falls short of it soft.

5

A body determined by its own boundary must be either hard or soft; for it either yields or does not.

It must also be concrete: or it could not be so determined. So since everything that is determined and solid is either hard or soft and these qualities are due to concretion, all composite and determined bodies must involve concretion. Concretion therefore must be discussed.

Now there are two causes besides matter, the agent and the quality brought about, the agent being the efficient cause, the quality the formal cause. Hence concretion and disaggregation, drying and moistening, must have these two causes.

But since concretion is a form of drying let us speak of the latter first.

As we have explained, the agent operates by means of two qualities and the patient is acted on in virtue of two qualities: action takes place by means of heat or cold, and the quality is produced either by the presence or by the absence of heat or

cold; but that which is acted upon is moist or dry or a compound of both. Water is the element characterized by the moist, earth that characterized by the dry, for these among the elements that admit the qualities moist and dry are passive. Therefore cold, too, being found in water and earth (both of which we recognize to be cold), must be reckoned rather as a passive quality. It is active only as contributing to destruction or incidentally in the manner described before; for cold is sometimes actually said to burn and to warm, but not in the same way as heat does, but by collecting and concentrating heat.

The subjects of drying are water and the various watery fluids and those bodies which contain water either foreign or connatural. By foreign I mean like the water in wool, by connatural, like that in milk. The watery fluids are wine, urine, whey, and in general those fluids which have no sediment or only a little, except where this absence of sediment is due to viscosity. For in some cases, in oil and pitch for instance, it is the viscosity which prevents any sediment from appearing.

It is always a process of heating or cooling that dries things, but the agent in both cases is heat, either internal or external. For even when things are dried by cooling, like a garment, where the moisture exists separately it is the internal heat that dries them. It carries off the moisture in the shape of vapour (if there is not too much of it), being itself driven out by the surrounding cold. So everything is dried, as we have said, by a process either of heating or cooling, but the agent is always heat, either internal or external, carrying off the moisture in vapour. By external heat I mean as where things are boiled: by internal where the heat breathes out and takes away and uses up its moisture. So much for drying.

6

Liquefaction is, first, condensation into water; second, the melting of a solidified body. The first, condensation, is due to the cooling of vapour: what melting is will appear from the account of solidification.

Whatever solidifies is either water or a mixture of earth and water, and the agent is either dry heat or cold. Hence those of the bodies solidified by heat or cold which are soluble at all are dissolved by their opposites. Bodies solidified by the dry-hot are dissolved by water, which is the moist-cold, while bodies solidified by cold are dissolved by fire, which is hot. Some things seem to be solidified by water, e.g. boiled honey, but really it is not the water but the cold in the water which effects the solidification. Aqueous bodies are not solidified by fire: for it is fire that dissolves them, and the same cause in the same relation cannot have opposite effects upon the same thing. Again, water solidifies owing to the departure of heat; so it will clearly be dissolved by the entry into it of heat: cold, therefore, must be the agent in solidifying it.

Hence aqueous bodies do not thicken when they solidify; for thickening occurs when the moisture goes off and the dry matter comes together, but water is the only liquid that does not thicken. Those bodies that are made up of both earth and water are solidified both by fire and by cold and in either case are thickened. The operation of the two is in a way the same and in a way different. Heat acts by drawing off the moisture, and as the moisture goes off in vapour the dry matter thickens and collects. Cold acts by driving out the heat, which is accompanied by the moisture as this goes off in vapour with it. Bodies that are soft but not liquid do not thicken but solidify when the moisture leaves them, e.g. potter's clay in process of

baking: but those mixed bodies that are liquid thicken besides solidifying, like milk. Those bodies which have first been thickened or hardened by cold often begin by becoming moist: thus potter's clay at first in the process of baking steams and grows softer, and is liable to distortion in the ovens for that reason.

Now of the bodies solidified by cold which are made up both of earth and water but in which the earth preponderates, those which solidify by the departure of heat melt by heat when it enters into them again; this is the case with frozen mud. But those which solidify by refrigeration, where all the moisture has gone off in vapour with the heat, like iron and horn, cannot be dissolved except by excessive heat, but they can be softened – though manufactured iron does melt, to the point of becoming fluid and then solidifying again. This is how steel is made. The dross sinks to the bottom and is purged away: when this has been done often and the metal is pure we have steel. The process is not repeated often because the purification of the metal involves great waste and loss of weight. But the iron that has less dross is the better iron. The stone pyrimachus, too, melts and forms into drops and becomes fluid; after having been in a fluid state it solidifies and becomes hard again. Millstones, too, melt and become fluid: when the fluid mass begins to solidify it is black but its consistency comes to be like that of lime. and earth, too

Of the bodies which are solidified by dry heat some are insoluble, others are dissolved by liquid. Pottery and some kinds of stone that are formed out of earth burnt up by fire, such as millstones, cannot be dissolved. Natron and salt are soluble by liquid, but not all liquid but only such as is cold. Hence water and any of its varieties melt them, but oil does not. For the opposite of the dry-hot is the cold-moist and what the one

solidified the other will dissolve, and so opposites will have opposite effects.

7

If a body contains more water than earth fire only thickens it: if it contains more earth fire solidifies it. Hence natron and salt and stone and potter's clay must contain more earth.

The nature of oil presents the greatest problem. If water preponderated in it, cold ought to solidify it; if earth preponderated, then fire ought to do so. Actually neither solidifies, but both thicken it. The reason is that it is full of air (hence it floats on the top of water, since air tends to rise). Cold thickens it by turning the air in it into water, for any mixture of oil and water is thicker than either. Fire and the lapse of time thicken and whiten it. The whitening follows on the evaporation of any water that may have been in it; the is due to the change of the air into water as the heat in the oil is dissipated. The effect in both cases is the same and the cause is the same, but the manner of its operation is different. Both heat and cold thicken it, but neither dries it (neither the sun nor cold dries oil), not only because it is glutinous but because it contains air. Its glutinous nature prevents it from giving off vapour and so fire does not dry it or boil it off.

Those bodies which are made up of earth and water may be classified according to the preponderance of either. There is a kind of wine, for instance, which both solidifies and thickens by boiling – I mean, must. All bodies of this kind lose their water as they That it is their water may be seen from the fact that the vapour from them condenses into water when collected. So wherever some sediment is left this is of the nature of earth.

Some of these bodies, as we have said, are also thickened and dried by cold. For cold not only solidifies but also dries water, and thickens things by turning air into water. (Solidifying, as we have said, is a form of drying.) Now those things that are not thickened by cold, but solidified, belong rather to water, e.g.. wine, urine, vinegar, lye, whey. But those things that are thickened (not by evaporation due to fire) are made up either of earth or of water and air: honey of earth, while oil contains air. Milk and blood, too, are made up of both water and earth, though earth generally predominates in them. So, too, are the liquids out of which natron and salt are formed; and stones are also formed from some mixtures of this kind. Hence, if the whey has not been separated, it burns away if you boil it over a fire. But the earthy element in milk can also be coagulated by the help of fig-juice, if you boil it in a certain way as doctors do when they treat it with fig-juice, and this is how the whey and the cheese are commonly separated. Whey, once separated, does not thicken, as the milk did, but boils away like water. Sometimes, however, there is little or no cheese in milk, and such milk is not nutritive and is more like water. The case of blood is similar: cold dries and so solidifies it. Those kinds of blood that do not solidify, like that of the stag, belong rather to water and are very cold. Hence they contain no fibres: for the fibres are of earth and solid, and blood from which they have been removed does not solidify. This is because it cannot dry; for what remains is water, just as what remains of milk when cheese has been removed is water. The fact that diseased blood will not solidify is evidence of the same thing, for such blood is of the nature of serum and that is phlegm and water, the nature of the animal having failed to get the better of it and digest it.

Some of these bodies are soluble, e.g. natron, some insoluble, e.g. pottery: of the latter, some, like horn, can be softened by heat, others, like pottery and stone, cannot. The reason is that opposite causes have opposite effects: consequently, if

solidification is due to two causes, the cold and the dry, solution must be due to the hot and the moist, that is, to fire and to water (these being opposites): water dissolving what was solidified by fire alone, fire what was solidified by cold alone. Consequently, if any things happen to be solidified by the action of both, these are least apt to be soluble. Such a case we find where things have been heated and are then solidified by cold. When the heat in leaving them has caused most of the moisture to evaporate, the cold so compacts these bodies together again as to leave no entrance even for moisture. Therefore heat does not dissolve them (for it only dissolves those bodies that are solidified by cold alone), nor does water (for it does not dissolve what cold solidifies, but only what is solidified by dry heat). But iron is melted by heat and solidified by cold. Wood consists of earth and air and is therefore combustible but cannot be melted or softened by heat. (For the same reason it floats in water – all except ebony. This does not, for other kinds of wood contain a preponderance of air, but in black ebony the air has escaped and so earth preponderates in it.) Pottery consists of earth alone because it solidified gradually in the process of drying. Water cannot get into it, for the pores were only large enough to admit of vapour escaping: and seeing that fire solidified it, that cannot dissolve it either.

So solidification and melting, their causes, and the kinds of subjects in which they occur have been described.

8

All this makes it clear that bodies are formed by heat and cold and that these agents operate by thickening and solidifying. It is because these qualities fashion bodies that we find heat in all of

them, and in some cold in so far as heat is absent. These qualities, then, are present as active, and the moist and the dry as passive, and consequently all four are found in mixed bodies. So water and earth are the constituents of homogeneous bodies both in plants and in animals and of metals such as gold, silver, and the rest – water and earth and their respective exhalations shut up in the compound bodies, as we have explained elsewhere.

All these mixed bodies are distinguished from one another, firstly by the qualities special to the various senses, that is, by their capacities of action. (For a thing is white, fragrant, sonant, sweet, hot, cold in virtue of a power of acting on sense). Secondly by other more characteristic affections which express their aptitude to be affected: I mean, for instance, the aptitude to melt or solidify or bend and so forth, all these qualities, like moist and dry, being passive. These are the qualities that differentiate bone, flesh, sinew, wood, bark, stone and all other homogeneous natural bodies. Let us begin by enumerating these qualities expressing the aptitude or inaptitude of a thing to be affected in a certain way. They are as follows: to be apt or inapt to solidify, melt, be softened by heat, be softened by water, bend, break, be comminuted, impressed, moulded, squeezed; to be tractile or non-tractile, malleable or non-malleable, to be fissile or non-fissile, apt or inapt to be cut; to be viscous or friable, compressible or incompressible, combustible or incombustible; to be apt or inapt to give off fumes. These affections differentiate most bodies from one another. Let us go on to explain the nature of each of them. We have already given a general account of that which is apt or inapt to solidify or to melt, but let us return to them again now. Of all the bodies that admit of solidification and hardening, some are brought into this state by heat, others by cold. Heat does this by drying up their moisture, cold by driving out their heat. Consequently some bodies are affected in this way by defect of moisture,

some by defect of heat: watery bodies by defect of heat, earthy bodies of moisture. Now those bodies that are so affected by defect of moisture are dissolved by water, unless like pottery they have so contracted that their pores are too small for the particles of water to enter. All those bodies in which this is not the case are dissolved by water, e.g. natron, salt, dry mud. Those bodies that solidified through defect of heat are melted by heat, e.g. ice, lead, copper. So much for the bodies that admit of solidification and of melting, and those that do not admit of melting.

The bodies which do not admit of solidification are those which contain no aqueous moisture and are not watery, but in which heat and earth preponderate, like honey and must (for these are in a sort of state of effervescence), and those which do possess some water but have a preponderance of air, like oil and quicksilver, and all viscous substances such as pitch and birdlime.

9

Those bodies admit of softening which are not (like ice) made up of water, but in which earth predominates. All their moisture must not have left them (as in the case of natron and salt), nor must the relation of dry to moist in them be incongruous (as in the case of pottery). They must be tractile (without admitting water) or malleable (without consisting of water), and the agent in softening them is fire. Such are iron and horn.

Both of bodies that can melt and of bodies that cannot, some do and some do not admit of softening in water. Copper, for instance, which can be melted, cannot be softened in water, whereas wool and earth can be softened in water, for they can

be soaked. (It is true that though copper can be melted the agent in its case is not water, but some of the bodies that can be melted by water too such as natron and salt cannot be softened in water: for nothing is said to be so affected unless the water soaks into it and makes it softer.) Some things, on the other hand, such as wool and grain, can be softened by water though they cannot be melted. Any body that is to be softened by water must be of earth and must have its pores larger than the particles of water, and the pores themselves must be able to resist the action of water, whereas bodies that can be 'melted' by water must have pores throughout.

(Why is it that earth is both 'melted' and softened by moisture, while natron is 'melted' but not softened? Because natron is pervaded throughout by pores so that the parts are immediately divided by the water, but earth has also pores which do not connect and is therefore differently affected according as the water enters by one or the other set of pores.)

Some bodies can be bent or straightened, like the reed or the withy, some cannot, like pottery and stone. Those bodies are apt to be bent and straightened which can change from being curved to being straight and from being straight to being curved, and bending and straightening consist in the change or motion to the straight or to a curve, for a thing is said to be in process of being bent whether it is being made to assume a convex or a concave shape. So bending is defined as motion to the convex or the concave without a change of length. For if we added 'or to the straight', we should have a thing bent and straight at once, and it is impossible for that which is straight to be bent. And if all bending is a bending back or a bending down, the former being a change to the convex, the latter to the concave, a motion that leads to the straight cannot be called bending, but bending and straightening are two different things.

These, then, are the things that can, and those that cannot be bent, and be straightened.

Some things can be both broken and comminuted, others admit only one or the other. Wood, for instance, can be broken but not comminuted, ice and stone can be comminuted but not broken, while pottery may either be comminuted or broken. The distinction is this: breaking is a division and separation into large parts, comminution into parts of any size, but there must be more of them than two. Now those solids that have many pores not communicating with one another are comminuible (for the limit to their subdivision is set by the pores), but those whose pores stretch continuously for a long way are breakable, while those which have pores of both kinds are both comminuible and breakable.

Some things, e.g. copper and wax, are impressible, others, e.g. pottery and water, are not. The process of being impressed is the sinking of a part of the surface of a thing in response to pressure or a blow, in general to contact. Such bodies are either soft, like wax, where part of the surface is depressed while the rest remains, or hard, like copper. Non-impressible bodies are either hard, like pottery (its surface does not give way and sink in), or liquid, like water (for though water does give way it is not in a part of it, for there is a reciprocal change of place of all its parts). Those impressibles that retain the shape impressed on them and are easily moulded by the hand are called ‘plastic’; those that are not easily moulded, such as stone or wood, or are easily moulded but do not retain the shape impressed, like wool or a sponge, are not plastic. The last group are said to be ‘squeezable’. Things are ‘squeezable’ when they can contract into themselves under pressure, their surface sinking in without being broken and without the parts interchanging position as happens in the case of water. (We speak of pressure when there is movement and the motor remains in contact with the thing

moved, of impact when the movement is due to the local movement of the motor.) Those bodies are subject to squeezing which have empty pores – empty, that is, of the stuff of which the body itself consists – and that can sink upon the void spaces within them, or rather upon their pores. For sometimes the pores upon which a body sinks in are not empty (a wet sponge, for instance, has its pores full). But the pores, if full, must be full of something softer than the body itself which is to contract. Examples of things squeezable are the sponge, wax, flesh. Those things are not squeezable which cannot be made to contract upon their own pores by pressure, either because they have no pores or because their pores are full of something too hard. Thus iron, stone, water and all liquids are incapable of being squeezed.

Things are tractile when their surface can be made to elongate, for being drawn out is a movement of the surface, remaining unbroken, in the direction of the mover. Some things are tractile, e.g. hair, thongs, sinew, dough, birdlime, and some are not, e.g. water, stone. Some things are both tractile and squeezable, e.g. wool; in other cases the two qualities do not coincide; phlegm, for instance, is tractile but not squeezable, and a sponge squeezable but not tractile.

Some things are malleable, like copper. Some are not, like stone and wood. Things are malleable when their surface can be made to move (but only in part) both downwards and sideways with one and the same blow: when this is not possible a body is not malleable. All malleable bodies are impressible, but not all impressible bodies are malleable, e.g. wood, though on the whole the two go together. Of squeezable things some are malleable and some not: wax and mud are malleable, wool is not. Some things are fissile, e.g. wood, some are not, e.g. potter's clay. A thing is fissile when it is apt to divide in advance of the instrument dividing it, for a body is said to split when it divides

to a further point than that to which the dividing instrument divides it and the act of division advances: which is not the case with cutting. Those bodies which cannot behave like this are non-fissile. Nothing soft is fissile (by soft I mean absolutely soft and not relatively: for iron itself may be relatively soft); nor are all hard things fissile, but only such as are neither liquid nor impressible nor comminuible. Such are the bodies that have the pores along which they cohere lengthwise and not crosswise.

Those hard or soft solids are apt to be cut which do not necessarily either split in advance of the instrument or break into minute fragments when they are being divided. Those that necessarily do so and liquids cannot be cut. Some things can be both split and cut, like wood, though generally it is lengthwise that a thing can be split and crosswise that it can be cut. For, a body being divided into many parts fin so far as its unity is made up of many lengths it is apt to be split, in so far as it is made up of many breadths it is apt to be cut.

A thing is viscous when, being moist or soft, it is tractile. Bodies owe this property to the interlocking of their parts when they are composed like chains, for then they can be drawn out to a great length and contracted again. Bodies that are not like this are friable. Bodies are compressible when they are squeezable and retain the shape they have been squeezed into; incompressible when they are either inapt to be squeezed at all or do not retain the shape they have been squeezed into.

Some bodies are combustible and some are not. Wood, wool, bone are combustible; stone, ice are not. Bodies are combustible when their pores are such as to admit fire and their longitudinal pores contain moisture weaker than fire. If they have no moisture, or if, as in ice or very green wood, the moisture is stronger than fire, they are not combustible.

Those bodies give off fumes which contain moisture, but in such a form that it does not go off separately in vapour when they are exposed to fire. For vapour is a moist secretion tending to the nature of air produced from a liquid by the agency of burning heat. Bodies that give off fumes give off secretions of the nature of air by the lapse of time: as they perish away they dry up or become earth. But the kind of secretion we are concerned with now differs from others in that it is not moist nor does it become wind (which is a continuous flow of air in a given direction). Fumes are common secretion of dry and moist together caused by the agency of burning heat. Hence they do not moisten things but rather colour them.

The fumes of a woody body are called smoke. (I mean to include bones and hair and everything of this kind in the same class. For there is no name common to all the objects that I mean, but, for all that, these things are all in the same class by analogy. Compare what Empedocles says: They are one and the same, hair and leaves and the thick wings of birds and scales that grow on stout limbs.) The fumes of fat are a sooty smoke and those of oily substances a greasy steam. Oil does not boil away or thicken by evaporation because it does not give off vapour but fumes. Water on the other hand does not give off fumes, but vapour. Sweet wine does give off fumes, for it contains fat and behaves like oil. It does not solidify under the influence of cold and it is apt to burn. Really it is not wine at all in spite of its name: for it does not taste like wine and consequently does not inebriate as ordinary wine does. It contains but little fumigable stuff and consequently is inflammable.

All bodies are combustible that dissolve into ashes, and all bodies do this that solidify under the influence either of heat or of both heat and cold; for we find that all these bodies are mastered by fire. Of stones the precious stone called carbuncle is least amenable to fire.

Of combustible bodies some are inflammable and some are not, and some of the former are reduced to coals. Those are called ‘inflammable’ which produce flame and those which do not are called ‘non-inflammable’. Those fumigable bodies that are not liquid are inflammable, but pitch, oil, wax are inflammable in conjunction with other bodies rather than by themselves. Most inflammable are those bodies that give off smoke. Of bodies of this kind those that contain more earth than smoke are apt to be reduced to coals. Some bodies that can be melted are not inflammable, e.g. copper; and some bodies that cannot be melted are inflammable, e.g. wood; and some bodies can be melted and are also inflammable, e.g. frankincense. The reason is that wood has its moisture all together and this is continuous throughout and so it burns up: whereas copper has it in each part but not continuous, and insufficient in quantity to give rise to flame. In frankincense it is disposed in both of these ways. Fumigable bodies are inflammable when earth predominates in them and they are consequently such as to be unable to melt. These are inflammable because they are dry like fire. When this dry comes to be hot there is fire. This is why flame is burning smoke or dry exhalation. The fumes of wood are smoke, those of wax and frankincense and such-like, and pitch and whatever contains pitch or such-like are sooty smoke, while the fumes of oil and oily substances are a greasy steam; so are those of all substances which are not at all combustible by themselves because there is too little of the dry in them (the dry being the means by which the transition to fire is effected), but burn very readily in conjunction with something else. (For the fat is just the conjunction of the oily with the dry.) So those bodies that give off fumes, like oil and pitch, belong rather to the moist, but those that burn to the dry.

10

Homogeneous bodies differ to touch – by these affections and differences, as we have said. They also differ in respect of their smell, taste, and colour.

By homogeneous bodies I mean, for instance, 'metals', gold, copper, silver, tin, iron, stone, and everything else of this kind and the bodies that are extracted from them; also the substances found in animals and plants, for instance, flesh, bones, sinew, skin, viscera, hair, fibres, veins (these are the elements of which the non-homogeneous bodies like the face, a hand, a foot, and everything of that kind are made up), and in plants, wood, bark, leaves, roots, and the rest like them.

The homogeneous bodies, it is true, are constituted by a different cause, but the matter of which they are composed is the dry and the moist, that is, water and earth (for these bodies exhibit those qualities most clearly). The agents are the hot and the cold, for they constitute and make concrete the homogeneous bodies out of earth and water as matter. Let us consider, then, which of the homogeneous bodies are made of earth and which of water, and which of both.

Of organized bodies some are liquid, some soft, some hard. The soft and the hard are constituted by a process of solidification, as we have already explained.

Those liquids that go off in vapour are made of water, those that do not are either of the nature of earth, or a mixture either of earth and water, like milk, or of earth and air, like wood, or of water and air, like oil. Those liquids which are thickened by heat are a mixture. (Wine is a liquid which raises a difficulty: for it is both liable to evaporation and it also thickens; for instance new wine does. The reason is that the word 'wine' is ambiguous and different 'wines' behave in different ways. New wine is more

earthy than old, and for this reason it is more apt to be thickened by heat and less apt to be congealed by cold. For it contains much heat and a great proportion of earth, as in Arcadia, where it is so dried up in its skins by the smoke that you scrape it to drink. If all wine has some sediment in it then it will belong to earth or to water according to the quantity of the sediment it possesses.) The liquids that are thickened by cold are of the nature of earth; those that are thickened either by heat or by cold consist of more than one element, like oil and honey, and 'sweet wine'.

Of solid bodies those that have been solidified by cold are of water, e.g. ice, snow, hail, hoar-frost. Those solidified by heat are of earth, e.g. pottery, cheese, natron, salt. Some bodies are solidified by both heat and cold. Of this kind are those solidified by refrigeration, that is by the privation both of heat and of the moisture which departs with the heat. For salt and the bodies that are purely of earth solidify by the privation of moisture only, ice by that of heat only, these bodies by that of both. So both the active qualities and both kinds of matter were involved in the process. Of these bodies those from which all the moisture has gone are all of them of earth, like pottery or amber. (For amber, also, and the bodies called 'tears' are formed by refrigeration, like myrrh, frankincense, gum. Amber, too, appears to belong to this class of things: the animals enclosed in it show that it is formed by solidification. The heat is driven out of it by the cold of the river and causes the moisture to evaporate with it, as in the case of honey when it has been heated and is immersed in water.) Some of these bodies cannot be melted or softened; for instance, amber and certain stones, e.g. the stalactites in caves. (For these stalactites, too, are formed in the same way: the agent is not fire, but cold which drives out the heat, which, as it leaves the body, draws out the moisture with it: in the other class of bodies the agent is external fire.) In those from which the moisture has not wholly

gone earth still preponderates, but they admit of softening by heat, e.g. iron and horn.

Now since we must include among ‘meltables’ those bodies which are melted by fire, these contain some water: indeed some of them, like wax, are common to earth and water alike. But those that are melted by water are of earth. Those that are not melted either by fire or water are of earth, or of earth and water.

Since, then, all bodies are either liquid or solid, and since the things that display the affections we have enumerated belong to these two classes and there is nothing intermediate, it follows that we have given a complete account of the criteria for distinguishing whether a body consists of earth or of water or of more elements than one, and whether fire was the agent in its formation, or cold, or both.

Gold, then, and silver and copper and tin and lead and glass and many nameless stone are of water: for they are all melted by heat. Of water, too, are some wines and urine and vinegar and lye and whey and serum: for they are all congealed by cold. In iron, horn, nails, bones, sinews, wood, hair, leaves, bark, earth preponderates. So, too, in amber, myrrh, frankincense, and all the substances called ‘tears’, and stalactites, and fruits, such as leguminous plants and corn. For things of this kind are, to a greater or less degree, of earth. For of all these bodies some admit of softening by heat, the rest give off fumes and are formed by refrigeration. So again in natron, salt, and those kinds of stones that are not formed by refrigeration and cannot be melted. Blood, on the other hand, and semen, are made up of earth and water and air. If the blood contains fibres, earth preponderates in it: consequently its solidifies by refrigeration and is melted by liquids; if not, it is of water and therefore does

not solidify. Semen solidifies by refrigeration, its moisture leaving it together with its heat.

11

We must investigate in the light of the results we have arrived at what solid or liquid bodies are hot and what cold.

Bodies consisting of water are commonly cold, unless (like lye, urine, wine) they contain foreign heat. Bodies consisting of earth, on the other hand, are commonly hot because heat was active in forming them: for instance lime and ashes.

We must recognize that cold is in a sense the matter of bodies. For the dry and the moist are matter (being passive) and earth and water are the elements that primarily embody them, and they are characterized by cold. Consequently cold must predominate in every body that consists of one or other of the elements simply, unless such a body contains foreign heat as water does when it boils or when it has been strained through ashes. This latter, too, has acquired heat from the ashes, for everything that has been burnt contains more or less heat. This explains the generation of animals in putrefying bodies: the putrefying body contains the heat which destroyed its proper heat.

Bodies made up of earth and water are hot, for most of them derive their existence from concoction and heat, though some, like the waste products of the body, are products of putrefaction. Thus blood, semen, marrow, figjuice, and all things of the kinds are hot as long as they are in their natural state, but when they perish and fall away from that state they are so no longer. For what is left of them is their matter and that is earth

and water. Hence both views are held about them, some people maintaining them to be cold and others to be warm; for they are observed to be hot when they are in their natural state, but to solidify when they have fallen away from it. That, then, is the case of mixed bodies. However, the distinction we laid down holds good: if its matter is predominantly water a body is cold (water being the complete opposite of fire), but if earth or air it tends to be warm.

It sometimes happens that the coldest bodies can be raised to the highest temperature by foreign heat; for the most solid and the hardest bodies are coldest when deprived of heat and most burning after exposure to fire: thus water is more burning than smoke and stone than water.

12

Having explained all this we must describe the nature of flesh, bone, and the other homogeneous bodies severally.

Our account of the formation of the homogeneous bodies has given us the elements out of which they are compounded and the classes into which they fall, and has made it clear to which class each of those bodies belongs. The homogeneous bodies are made up of the elements, and all the works of nature in turn of the homogeneous bodies as matter. All the homogeneous bodies consist of the elements described, as matter, but their essential nature is determined by their definition. This fact is always clearer in the case of the later products of those, in fact, that are instruments, as it were, and have an end: it is clearer, for instance, that a dead man is a man only in name. And so the hand of a dead man, too, will in the same way be a hand in name only, just as stone flutes might still be called flutes: for

these members, too, are instruments of a kind. But in the case of flesh and bone the fact is not so clear to see, and in that of fire and water even less. For the end is least obvious there where matter predominates most. If you take the extremes, matter is pure matter and the essence is pure definition; but the bodies intermediate between the two are matter or definition in proportion as they are near to either. For each of those elements has an end and is not water or fire in any and every condition of itself, just as flesh is not flesh nor viscera viscera, and the same is true in a higher degree with face and hand. What a thing is always determined by its function: a thing really is itself when it can perform its function; an eye, for instance, when it can see. When a thing cannot do so it is that thing only in name, like a dead eye or one made of stone, just as a wooden saw is no more a saw than one in a picture. The same, then, is true of flesh, except that its function is less clear than that of the tongue. So, too, with fire; but its function is perhaps even harder to specify by physical inquiry than that of flesh. The parts of plants, and inanimate bodies like copper and silver, are in the same case. They all are what they are in virtue of a certain power of action or passion – just like flesh and sinew. But we cannot state their form accurately, and so it is not easy to tell when they are really there and when they are not unless the body is thoroughly corrupted and its shape only remains. So ancient corpses suddenly become ashes in the grave and very old fruit preserves its shape only but not its taste: so, too, with the solids that form from milk.

Now heat and cold and the motions they set up as the bodies are solidified by the hot and the cold are sufficient to form all such parts as are the homogeneous bodies, flesh, bone, hair, sinew, and the rest. For they are all of them differentiated by the various qualities enumerated above, tension, tractility, comminuibility, hardness, softness, and the rest of them: all of which are derived from the hot and the cold and the mixture of

their motions. But no one would go as far as to consider them sufficient in the case of the non-homogeneous parts (like the head, the hand, or the foot) which these homogeneous parts go to make up. Cold and heat and their motion would be admitted to account for the formation of copper or silver, but not for that of a saw, a bowl, or a box. So here, save that in the examples given the cause is art, but in the nonhomogeneous bodies nature or some other cause.

Since, then, we know to what element each of the homogeneous bodies belongs, we must now find the definition of each of them, the answer, that is, to the question, 'what is' flesh, semen, and the rest? For we know the cause of a thing and its definition when we know the material or the formal or, better, both the material and the formal conditions of its generation and destruction, and the efficient cause of it.

After the homogeneous bodies have been explained we must consider the non-homogeneous too, and lastly the bodies made up of these, such as man, plants, and the rest.

Aristotle - On the Soul

[Translated by J. A. Smith]

Book I

1

Holding as we do that, while knowledge of any kind is a thing to be honoured and prized, one kind of it may, either by reason of its greater exactness or of a higher dignity and greater wonderfulness in its objects, be more honourable and precious than another, on both accounts we should naturally be led to place in the front rank the study of the soul. The knowledge of the soul admittedly contributes greatly to the advance of truth in general, and, above all, to our understanding of Nature, for the soul is in some sense the principle of animal life. Our aim is to grasp and understand, first its essential nature, and secondly its properties; of these some are taught to be affections proper to the soul itself, while others are considered to attach to the animal owing to the presence within it of soul.

To attain any assured knowledge about the soul is one of the most difficult things in the world. As the form of question which here presents itself, viz. the question 'What is it?', recurs in other fields, it might be supposed that there was some single method of inquiry applicable to all objects whose essential nature (as we are endeavouring to ascertain there is for derived properties the single method of demonstration); in that case what we should have to seek for would be this unique method. But if there is no such single and general method for solving the question of essence, our task becomes still more difficult; in the

case of each different subject we shall have to determine the appropriate process of investigation. If to this there be a clear answer, e.g. that the process is demonstration or division, or some known method, difficulties and hesitations still beset us – with what facts shall we begin the inquiry? For the facts which form the starting-points in different subjects must be different, as e.g. in the case of numbers and surfaces.

First, no doubt, it is necessary to determine in which of the summa genera soul lies, what it is; is it 'a this-somewhat, 'a substance, or is it a quale or a quantum, or some other of the remaining kinds of predicates which we have distinguished? Further, does soul belong to the class of potential existents, or is it not rather an actuality? Our answer to this question is of the greatest importance.

We must consider also whether soul is divisible or is without parts, and whether it is everywhere homogeneous or not; and if not homogeneous, whether its various forms are different specifically or generically: up to the present time those who have discussed and investigated soul seem to have confined themselves to the human soul. We must be careful not to ignore the question whether soul can be defined in a single unambiguous formula, as is the case with animal, or whether we must not give a separate formula for each of it, as we do for horse, dog, man, god (in the latter case the 'universal' animal – and so too every other 'common predicate' – being treated either as nothing at all or as a later product). Further, if what exists is not a plurality of souls, but a plurality of parts of one soul, which ought we to investigate first, the whole soul or its parts? (It is also a difficult problem to decide which of these parts are in nature distinct from one another.) Again, which ought we to investigate first, these parts or their functions, mind or thinking, the faculty or the act of sensation, and so on? If the investigation of the functions precedes that of the parts,

the further question suggests itself: ought we not before either to consider the correlative objects, e.g. of sense or thought? It seems not only useful for the discovery of the causes of the derived properties of substances to be acquainted with the essential nature of those substances (as in mathematics it is useful for the understanding of the property of the equality of the interior angles of a triangle to two right angles to know the essential nature of the straight and the curved or of the line and the plane) but also conversely, for the knowledge of the essential nature of a substance is largely promoted by an acquaintance with its properties: for, when we are able to give an account conformable to experience of all or most of the properties of a substance, we shall be in the most favourable position to say something worth saying about the essential nature of that subject; in all demonstration a definition of the essence is required as a starting-point, so that definitions which do not enable us to discover the derived properties, or which fail to facilitate even a conjecture about them, must obviously, one and all, be dialectical and futile.

A further problem presented by the affections of soul is this: are they all affections of the complex of body and soul, or is there any one among them peculiar to the soul by itself? To determine this is indispensable but difficult. If we consider the majority of them, there seems to be no case in which the soul can act or be acted upon without involving the body; e.g. anger, courage, appetite, and sensation generally. Thinking seems the most probable exception; but if this too proves to be a form of imagination or to be impossible without imagination, it too requires a body as a condition of its existence. If there is any way of acting or being acted upon proper to soul, soul will be capable of separate existence; if there is none, its separate existence is impossible. In the latter case, it will be like what is straight, which has many properties arising from the straightness in it, e.g. that of touching a bronze sphere at a

point, though straightness divorced from the other constituents of the straight thing cannot touch it in this way; it cannot be so divorced at all, since it is always found in a body. It therefore seems that all the affections of soul involve a body – passion, gentleness, fear, pity, courage, joy, loving, and hating; in all these there is a concurrent affection of the body. In support of this we may point to the fact that, while sometimes on the occasion of violent and striking occurrences there is no excitement or fear felt, on others faint and feeble stimulations produce these emotions, viz. when the body is already in a state of tension resembling its condition when we are angry. Here is a still clearer case: in the absence of any external cause of terror we find ourselves experiencing the feelings of a man in terror. From all this it is obvious that the affections of soul are enmattered formulable essences.

Consequently their definitions ought to correspond, e.g. anger should be defined as a certain mode of movement of such and such a body (or part or faculty of a body) by this or that cause and for this or that end. That is precisely why the study of the soul must fall within the science of Nature, at least so far as in its affections it manifests this double character. Hence a physicist would define an affection of soul differently from a dialectician; the latter would define e.g. anger as the appetite for returning pain for pain, or something like that, while the former would define it as a boiling of the blood or warm substance surround the heart. The latter assigns the material conditions, the former the form or formulable essence; for what he states is the formulable essence of the fact, though for its actual existence there must be embodiment of it in a material such as is described by the other. Thus the essence of a house is assigned in such a formula as 'a shelter against destruction by wind, rain, and heat'; the physicist would describe it as 'stones, bricks, and timbers'; but there is a third possible description which would say that it was that form in that material with that

purpose or end. Which, then, among these is entitled to be regarded as the genuine physicist? The one who confines himself to the material, or the one who restricts himself to the formulable essence alone? Is it not rather the one who combines both in a single formula? If this is so, how are we to characterize the other two? Must we not say that there is no type of thinker who concerns himself with those qualities or attributes of the material which are in fact inseparable from the material, and without attempting even in thought to separate them? The physicist is he who concerns himself with all the properties active and passive of bodies or materials thus or thus defined; attributes not considered as being of this character he leaves to others, in certain cases it may be to a specialist, e.g. a carpenter or a physician, in others (a) where they are inseparable in fact, but are separable from any particular kind of body by an effort of abstraction, to the mathematician, (b) where they are separate both in fact and in thought from body altogether, to the First Philosopher or metaphysician. But we must return from this digression, and repeat that the affections of soul are inseparable from the material substratum of animal life, to which we have seen that such affections, e.g. passion and fear, attach, and have not the same mode of being as a line or a plane.

2

For our study of soul it is necessary, while formulating the problems of which in our further advance we are to find the solutions, to call into council the views of those of our predecessors who have declared any opinion on this subject, in order that we may profit by whatever is sound in their suggestions and avoid their errors.

The starting-point of our inquiry is an exposition of those characteristics which have chiefly been held to belong to soul in its very nature. Two characteristic marks have above all others been recognized as distinguishing that which has soul in it from that which has not – movement and sensation. It may be said that these two are what our predecessors have fixed upon as characteristic of soul.

Some say that what originates movement is both pre-eminently and primarily soul; believing that what is not itself moved cannot originate movement in another, they arrived at the view that soul belongs to the class of things in movement. This is what led Democritus to say that soul is a sort of fire or hot substance; his 'forms' or atoms are infinite in number; those which are spherical he calls fire and soul, and compares them to the motes in the air which we see in shafts of light coming through windows; the mixture of seeds of all sorts he calls the elements of the whole of Nature (Leucippus gives a similar account); the spherical atoms are identified with soul because atoms of that shape are most adapted to permeate everywhere, and to set all the others moving by being themselves in movement. This implies the view that soul is identical with what produces movement in animals. That is why, further, they regard respiration as the characteristic mark of life; as the environment compresses the bodies of animals, and tends to extrude those atoms which impart movement to them, because they themselves are never at rest, there must be a reinforcement of these by similar atoms coming in from without in the act of respiration; for they prevent the extrusion of those which are already within by counteracting the compressing and consolidating force of the environment; and animals continue to live only so long as they are able to maintain this resistance.

The doctrine of the Pythagoreans seems to rest upon the same ideas; some of them declared the motes in air, others what moved them, to be soul. These motes were referred to because they are seen always in movement, even in a complete calm.

The same tendency is shown by those who define soul as that which moves itself; all seem to hold the view that movement is what is closest to the nature of soul, and that while all else is moved by soul, it alone moves itself. This belief arises from their never seeing anything originating movement which is not first itself moved.

Similarly also Anaxagoras (and whoever agrees with him in saying that mind set the whole in movement) declares the moving cause of things to be soul. His position must, however, be distinguished from that of Democritus. Democritus roundly identifies soul and mind, for he identifies what appears with what is true – that is why he commends Homer for the phrase 'Hector lay with thought distraught'; he does not employ mind as a special faculty dealing with truth, but identifies soul and mind. What Anaxagoras says about them is more obscure; in many places he tells us that the cause of beauty and order is mind, elsewhere that it is soul; it is found, he says, in all animals, great and small, high and low, but mind (in the sense of intelligence) appears not to belong alike to all animals, and indeed not even to all human beings.

All those, then, who had special regard to the fact that what has soul in it is moved, adopted the view that soul is to be identified with what is eminently originative of movement. All, on the other hand, who looked to the fact that what has soul in it knows or perceives what is, identify soul with the principle or principles of Nature, according as they admit several such principles or one only. Thus Empedocles declares that it is

formed out of all his elements, each of them also being soul; his words are:

For 'tis by Earth we see Earth, by Water Water,

By Ether Ether divine, by Fire destructive Fire,

By Love Love, and Hate by cruel Hate.

In the same way Plato in the Timaeus fashions soul out of his elements; for like, he holds, is known by like, and things are formed out of the principles or elements, so that soul must be so too. Similarly also in his lectures 'On Philosophy' it was set forth that the Animal-itself is compounded of the Idea itself of the One together with the primary length, breadth, and depth, everything else, the objects of its perception, being similarly constituted. Again he puts his view in yet other terms: Mind is the monad, science or knowledge the dyad (because it goes undeviatingly from one point to another), opinion the number of the plane, sensation the number of the solid; the numbers are by him expressly identified with the Forms themselves or principles, and are formed out of the elements; now things are apprehended either by mind or science or opinion or sensation, and these same numbers are the Forms of things.

Some thinkers, accepting both premisses, viz. that the soul is both originative of movement and cognitive, have compounded it of both and declared the soul to be a self-moving number.

As to the nature and number of the first principles opinions differ. The difference is greatest between those who regard them as corporeal and those who regard them as incorporeal, and from both dissent those who make a blend and draw their principles from both sources. The number of principles is also in dispute; some admit one only, others assert several. There is a consequent diversity in their several accounts of soul; they assume, naturally enough, that what is in its own nature

originative of movement must be among what is primordial. That has led some to regard it as fire, for fire is the subtlest of the elements and nearest to incorporeality; further, in the most primary sense, fire both is moved and originates movement in all the others.

Democritus has expressed himself more ingeniously than the rest on the grounds for ascribing each of these two characters to soul; soul and mind are, he says, one and the same thing, and this thing must be one of the primary and indivisible bodies, and its power of originating movement must be due to its fineness of grain and the shape of its atoms; he says that of all the shapes the spherical is the most mobile, and that this is the shape of the particles of fire and mind.

Anaxagoras, as we said above, seems to distinguish between soul and mind, but in practice he treats them as a single substance, except that it is mind that he specially posits as the principle of all things; at any rate what he says is that mind alone of all that is simple, unmixed, and pure. He assigns both characteristics, knowing and origination of movement, to the same principle, when he says that it was mind that set the whole in movement.

Thales, too, to judge from what is recorded about him, seems to have held soul to be a motive force, since he said that the magnet has a soul in it because it moves the iron.

Diogenes (and others) held the soul to be air because he believed air to be finest in grain and a first principle; therein lay the grounds of the soul's powers of knowing and originating movement. As the primordial principle from which all other things are derived, it is cognitive; as finest in grain, it has the power to originate movement.

Heraclitus too says that the first principle – the 'warm exhalation' of which, according to him, everything else is composed – is soul; further, that this exhalation is most incorporeal and in ceaseless flux; that what is in movement requires that what knows it should be in movement; and that all that is has its being essentially in movement (herein agreeing with the majority).

Alcmaeon also seems to have held a similar view about soul; he says that it is immortal because it resembles 'the immortals,' and that this immortality belongs to it in virtue of its ceaseless movement; for all the 'things divine,' moon, sun, the planets, and the whole heavens, are in perpetual movement.

of More superficial writers, some, e.g. Hippo, have pronounced it to be water; they seem to have argued from the fact that the seed of all animals is fluid, for Hippo tries to refute those who say that the soul is blood, on the ground that the seed, which is the primordial soul, is not blood.

Another group (Critias, for example) did hold it to be blood; they take perception to be the most characteristic attribute of soul, and hold that perceptiveness is due to the nature of blood.

Each of the elements has thus found its partisan, except earth – earth has found no supporter unless we count as such those who have declared soul to be, or to be compounded of, all the elements. All, then, it may be said, characterize the soul by three marks, Movement, Sensation, Incorporeality, and each of these is traced back to the first principles. That is why (with one exception) all those who define the soul by its power of knowing make it either an element or constructed out of the elements. The language they all use is similar; like, they say, is known by like; as the soul knows everything, they construct it out of all the principles. Hence all those who admit but one cause or element, make the soul also one (e.g. fire or air), while those

who admit a multiplicity of principles make the soul also multiple. The exception is Anaxagoras; he alone says that mind is impassible and has nothing in common with anything else. But, if this is so, how or in virtue of what cause can it know? That Anaxagoras has not explained, nor can any answer be inferred from his words. All who acknowledge pairs of opposites among their principles, construct the soul also out of these contraries, while those who admit as principles only one contrary of each pair, e.g. either hot or cold, likewise make the soul some one of these. That is why, also, they allow themselves to be guided by the names; those who identify soul with the hot argue that sen (to live) is derived from sein (to boil), while those who identify it with the cold say that soul (psuche) is so called from the process of respiration and (katapsuxis). Such are the traditional opinions concerning soul, together with the grounds on which they are maintained.

3

We must begin our examination with movement; for doubtless, not only is it false that the essence of soul is correctly described by those who say that it is what moves (or is capable of moving) itself, but it is an impossibility that movement should be even an attribute of it.

We have already pointed out that there is no necessity that what originates movement should itself be moved. There are two senses in which anything may be moved – either (a) indirectly, owing to something other than itself, or (b) directly, owing to itself. Things are 'indirectly moved' which are moved as being contained in something which is moved, e.g. sailors in a ship, for they are moved in a different sense from that in

which the ship is moved; the ship is 'directly moved', they are 'indirectly moved', because they are in a moving vessel. This is clear if we consider their limbs; the movement proper to the legs (and so to man) is walking, and in this case the sailors tare not walking. Recognizing the double sense of 'being moved', what we have to consider now is whether the soul is 'directly moved' and participates in such direct movement.

There are four species of movement – locomotion, alteration, diminution, growth; consequently if the soul is moved, it must be moved with one or several or all of these species of movement. Now if its movement is not incidental, there must be a movement natural to it, and, if so, as all the species enumerated involve place, place must be natural to it. But if the essence of soul be to move itself, its being moved cannot be incidental to – as it is to what is white or three cubits long; they too can be moved, but only incidentally – what is moved is that of which 'white' and 'three cubits long' are the attributes, the body in which they inhere; hence they have no place: but if the soul naturally partakes in movement, it follows that it must have a place.

Further, if there be a movement natural to the soul, there must be a counter-movement unnatural to it, and conversely. The same applies to rest as well as to movement; for the terminus ad quem of a thing's natural movement is the place of its natural rest, and similarly the terminus ad quem of its enforced movement is the place of its enforced rest. But what meaning can be attached to enforced movements or rests of the soul, it is difficult even to imagine.

Further, if the natural movement of the soul be upward, the soul must be fire; if downward, it must be earth; for upward and downward movements are the definitory characteristics of these bodies. The same reasoning applies to the intermediate

movements, termini, and bodies. Further, since the soul is observed to originate movement in the body, it is reasonable to suppose that it transmits to the body the movements by which it itself is moved, and so, reversing the order, we may infer from the movements of the body back to similar movements of the soul. Now the body is moved from place to place with movements of locomotion. Hence it would follow that the soul too must in accordance with the body change either its place as a whole or the relative places of its parts. This carries with it the possibility that the soul might even quit its body and re-enter it, and with this would be involved the possibility of a resurrection of animals from the dead. But, it may be contended, the soul can be moved indirectly by something else; for an animal can be pushed out of its course. Yes, but that to whose essence belongs the power of being moved by itself, cannot be moved by something else except incidentally, just as what is good by or in itself cannot owe its goodness to something external to it or to some end to which it is a means.

If the soul is moved, the most probable view is that what moves it is sensible things.

We must note also that, if the soul moves itself, it must be the mover itself that is moved, so that it follows that if movement is in every case a displacement of that which is in movement, in that respect in which it is said to be moved, the movement of the soul must be a departure from its essential nature, at least if its self-movement is essential to it, not incidental.

Some go so far as to hold that the movements which the soul imparts to the body in which it is are the same in kind as those with which it itself is moved. An example of this is Democritus, who uses language like that of the comic dramatist Philippus, who accounts for the movements that Daedalus imparted to his wooden Aphrodite by saying that he poured quicksilver into it;

similarly Democritus says that the spherical atoms which according to him constitute soul, owing to their own ceaseless movements draw the whole body after them and so produce its movements. We must urge the question whether it is these very same atoms which produce rest also – how they could do so, it is difficult and even impossible to say. And, in general, we may object that it is not in this way that the soul appears to originate movement in animals – it is through intention or process of thinking.

It is in the same fashion that the Timaeus also tries to give a physical account of how the soul moves its body; the soul, it is there said, is in movement, and so owing to their mutual implication moves the body also. After compounding the soul-substance out of the elements and dividing it in accordance with the harmonic numbers, in order that it may possess a connate sensibility for 'harmony' and that the whole may move in movements well attuned, the Demiurge bent the straight line into a circle; this single circle he divided into two circles united at two common points; one of these he subdivided into seven circles. All this implies that the movements of the soul are identified with the local movements of the heavens.

Now, in the first place, it is a mistake to say that the soul is a spatial magnitude. It is evident that Plato means the soul of the whole to be like the sort of soul which is called mind not like the sensitive or the desiderative soul, for the movements of neither of these are circular. Now mind is one and continuous in the sense in which the process of thinking is so, and thinking is identical with the thoughts which are its parts; these have a serial unity like that of number, not a unity like that of a spatial magnitude. Hence mind cannot have that kind of unity either; mind is either without parts or is continuous in some other way than that which characterizes a spatial magnitude. How, indeed, if it were a spatial magnitude, could mind possibly think? Will it

think with any one indifferently of its parts? In this case, the 'part' must be understood either in the sense of a spatial magnitude or in the sense of a point (if a point can be called a part of a spatial magnitude). If we accept the latter alternative, the points being infinite in number, obviously the mind can never exhaustively traverse them; if the former, the mind must think the same thing over and over again, indeed an infinite number of times (whereas it is manifestly possible to think a thing once only). If contact of any part whatsoever of itself with the object is all that is required, why need mind move in a circle, or indeed possess magnitude at all? On the other hand, if contact with the whole circle is necessary, what meaning can be given to the contact of the parts? Further, how could what has no parts think what has parts, or what has parts think what has none? We must identify the circle referred to with mind; for it is mind whose movement is thinking, and it is the circle whose movement is revolution, so that if thinking is a movement of revolution, the circle which has this characteristic movement must be mind.

If the circular movement is eternal, there must be something which mind is always thinking – what can this be? For all practical processes of thinking have limits – they all go on for the sake of something outside the process, and all theoretical processes come to a close in the same way as the phrases in speech which express processes and results of thinking. Every such linguistic phrase is either definitory or demonstrative. Demonstration has both a starting-point and may be said to end in a conclusion or inferred result; even if the process never reaches final completion, at any rate it never returns upon itself again to its starting-point, it goes on assuming a fresh middle term or a fresh extreme, and moves straight forward, but circular movement returns to its starting-point. Definitions, too, are closed groups of terms.

Further, if the same revolution is repeated, mind must repeatedly think the same object.

Further, thinking has more resemblance to a coming to rest or arrest than to a movement; the same may be said of inferring.

It might also be urged that what is difficult and enforced is incompatible with blessedness; if the movement of the soul is not of its essence, movement of the soul must be contrary to its nature. It must also be painful for the soul to be inextricably bound up with the body; nay more, if, as is frequently said and widely accepted, it is better for mind not to be embodied, the union must be for it undesirable.

Further, the cause of the revolution of the heavens is left obscure. It is not the essence of soul which is the cause of this circular movement – that movement is only incidental to soul – nor is, a fortiori, the body its cause. Again, it is not even asserted that it is better that soul should be so moved; and yet the reason for which God caused the soul to move in a circle can only have been that movement was better for it than rest, and movement of this kind better than any other. But since this sort of consideration is more appropriate to another field of speculation, let us dismiss it for the present.

The view we have just been examining, in company with most theories about the soul, involves the following absurdity: they all join the soul to a body, or place it in a body, without adding any specification of the reason of their union, or of the bodily conditions required for it. Yet such explanation can scarcely be omitted; for some community of nature is presupposed by the fact that the one acts and the other is acted upon, the one moves and the other is moved; interaction always implies a special nature in the two interagents. All, however, that these thinkers do is to describe the specific characteristics of the soul; they do not try to determine anything about the body which is

to contain it, as if it were possible, as in the Pythagorean myths, that any soul could be clothed upon with any body – an absurd view, for each body seems to have a form and shape of its own. It is as absurd as to say that the art of carpentry could embody itself in flutes; each art must use its tools, each soul its body.

4

There is yet another theory about soul, which has commended itself to many as no less probable than any of those we have hitherto mentioned, and has rendered public account of itself in the court of popular discussion. Its supporters say that the soul is a kind of harmony, for (a) harmony is a blend or composition of contraries, and (b) the body is compounded out of contraries. Harmony, however, is a certain proportion or composition of the constituents blended, and soul can be neither the one nor the other of these. Further, the power of originating movement cannot belong to a harmony, while almost all concur in regarding this as a principal attribute of soul. It is more appropriate to call health (or generally one of the good states of the body) a harmony than to predicate it of the soul. The absurdity becomes most apparent when we try to attribute the active and passive affections of the soul to a harmony; the necessary readjustment of their conceptions is difficult. Further, in using the word 'harmony' we have one or other of two cases in our mind; the most proper sense is in relation to spatial magnitudes which have motion and position, where harmony means the disposition and cohesion of their parts in such a manner as to prevent the introduction into the whole of anything homogeneous with it, and the secondary sense, derived from the former, is that in which it means the ratio between the constituents so blended; in neither of these senses

is it plausible to predicate it of soul. That soul is a harmony in the sense of the mode of composition of the parts of the body is a view easily refutable; for there are many composite parts and those variously compounded; of what bodily part is mind or the sensitive or the appetitive faculty the mode of composition? And what is the mode of composition which constitutes each of them? It is equally absurd to identify the soul with the ratio of the mixture; for the mixture which makes flesh has a different ratio between the elements from that which makes bone. The consequence of this view will therefore be that distributed throughout the whole body there will be many souls, since every one of the bodily parts is a different mixture of the elements, and the ratio of mixture is in each case a harmony, i.e. a soul.

From Empedocles at any rate we might demand an answer to the following question for he says that each of the parts of the body is what it is in virtue of a ratio between the elements: is the soul identical with this ratio, or is it not rather something over and above this which is formed in the parts? Is love the cause of any and every mixture, or only of those that are in the right ratio? Is love this ratio itself, or is love something over and above this? Such are the problems raised by this account. But, on the other hand, if the soul is different from the mixture, why does it disappear at one and the same moment with that relation between the elements which constitutes flesh or the other parts of the animal body? Further, if the soul is not identical with the ratio of mixture, and it is consequently not the case that each of the parts has a soul, what is that which perishes when the soul quits the body?

That the soul cannot either be a harmony, or be moved in a circle, is clear from what we have said. Yet that it can be moved incidentally is, as we said above, possible, and even that in a sense it can move itself, i.e. in the sense that the vehicle in

which it is can be moved, and moved by it; in no other sense can the soul be moved in space.

More legitimate doubts might remain as to its movement in view of the following facts. We speak of the soul as being pained or pleased, being bold or fearful, being angry, perceiving, thinking. All these are regarded as modes of movement, and hence it might be inferred that the soul is moved. This, however, does not necessarily follow. We may admit to the full that being pained or pleased, or thinking, are movements (each of them a 'being moved'), and that the movement is originated by the soul. For example we may regard anger or fear as such and such movements of the heart, and thinking as such and such another movement of that organ, or of some other; these modifications may arise either from changes of place in certain parts or from qualitative alterations (the special nature of the parts and the special modes of their changes being for our present purpose irrelevant). Yet to say that it is the soul which is angry is as inexact as it would be to say that it is the soul that weaves webs or builds houses. It is doubtless better to avoid saying that the soul pities or learns or thinks and rather to say that it is the man who does this with his soul. What we mean is not that the movement is in the soul, but that sometimes it terminates in the soul and sometimes starts from it, sensation e.g. coming from without inwards, and reminiscence starting from the soul and terminating with the movements, actual or residual, in the sense organs.

The case of mind is different; it seems to be an independent substance implanted within the soul and to be incapable of being destroyed. If it could be destroyed at all, it would be under the blunting influence of old age. What really happens in respect of mind in old age is, however, exactly parallel to what happens in the case of the sense organs; if the old man could recover the proper kind of eye, he would see just as well as the

young man. The incapacity of old age is due to an affection not of the soul but of its vehicle, as occurs in drunkenness or disease. Thus it is that in old age the activity of mind or intellectual apprehension declines only through the decay of some other inward part; mind itself is impassible. Thinking, loving, and hating are affections not of mind, but of that which has mind, so far as it has it. That is why, when this vehicle decays, memory and love cease; they were activities not of mind, but of the composite which has perished; mind is, no doubt, something more divine and impassible. That the soul cannot be moved is therefore clear from what we have said, and if it cannot be moved at all, manifestly it cannot be moved by itself.

Of all the opinions we have enumerated, by far the most unreasonable is that which declares the soul to be a self-moving number; it involves in the first place all the impossibilities which follow from regarding the soul as moved, and in the second special absurdities which follow from calling it a number. How we to imagine a unit being moved? By what agency? What sort of movement can be attributed to what is without parts or internal differences? If the unit is both originative of movement and itself capable of being moved, it must contain difference.

Further, since they say a moving line generates a surface and a moving point a line, the movements of the psychic units must be lines (for a point is a unit having position, and the number of the soul is, of course, somewhere and has position).

Again, if from a number a number or a unit is subtracted, the remainder is another number; but plants and many animals when divided continue to live, and each segment is thought to retain the same kind of soul.

It must be all the same whether we speak of units or corpuscles; for if the spherical atoms of Democritus became points, nothing being retained but their being a quantum, there must remain in each a moving and a moved part, just as there is in what is continuous; what happens has nothing to do with the size of the atoms, it depends solely upon their being a quantum. That is why there must be something to originate movement in the units. If in the animal what originates movement is the soul, so also must it be in the case of the number, so that not the mover and the moved together, but the mover only, will be the soul. But how is it possible for one of the units to fulfil this function of originating movement? There must be some difference between such a unit and all the other units, and what difference can there be between one placed unit and another except a difference of position? If then, on the other hand, these psychic units within the body are different from the points of the body, there will be two sets of units both occupying the same place; for each unit will occupy a point. And yet, if there can be two, why cannot there be an infinite number? For if things can occupy an indivisible lace, they must themselves be indivisible. If, on the other hand, the points of the body are identical with the units whose number is the soul, or if the number of the points in the body is the soul, why have not all bodies souls? For all bodies contain points or an infinity of points.

Further, how is it possible for these points to be isolated or separated from their bodies, seeing that lines cannot be resolved into points?

5

The result is, as we have said, that this view, while on the one side identical with that of those who maintain that soul is a subtle kind of body, is on the other entangled in the absurdity peculiar to Democritus' way of describing the manner in which movement is originated by soul. For if the soul is present throughout the whole percipient body, there must, if the soul be a kind of body, be two bodies in the same place; and for those who call it a number, there must be many points at one point, or every body must have a soul, unless the soul be a different sort of number – other, that is, than the sum of the points existing in a body. Another consequence that follows is that the animal must be moved by its number precisely in the way that Democritus explained its being moved by his spherical psychic atoms. What difference does it make whether we speak of small spheres or of large units, or, quite simply, of units in movement? One way or another, the movements of the animal must be due to their movements. Hence those who combine movement and number in the same subject lay themselves open to these and many other similar absurdities. It is impossible not only that these characters should give the definition of soul – it is impossible that they should even be attributes of it. The point is clear if the attempt be made to start from this as the account of soul and explain from it the affections and actions of the soul, e.g. reasoning, sensation, pleasure, pain, &c. For, to repeat what we have said earlier, movement and number do not facilitate even conjecture about the derivative properties of soul.

Such are the three ways in which soul has traditionally been defined; one group of thinkers declared it to be that which is most originative of movement because it moves itself, another group to be the subtlest and most nearly incorporeal of all kinds of body. We have now sufficiently set forth the difficulties and inconsistencies to which these theories are exposed. It remains

now to examine the doctrine that soul is composed of the elements.

The reason assigned for this doctrine is that thus the soul may perceive or come to know everything that is, but the theory necessarily involves itself in many impossibilities. Its upholders assume that like is known only by like, and imagine that by declaring the soul to be composed of the elements they succeed in identifying the soul with all the things it is capable of apprehending. But the elements are not the only things it knows; there are many others, or, more exactly, an infinite number of others, formed out of the elements. Let us admit that the soul knows or perceives the elements out of which each of these composites is made up; but by what means will it know or perceive the composite whole, e.g. what God, man, flesh, bone (or any other compound) is? For each is, not merely the elements of which it is composed, but those elements combined in a determinate mode or ratio, as Empedocles himself says of bone,

The kindly Earth in its broad-bosomed moulds

Won of clear Water two parts out of eight,

And four of Fire; and so white bones were formed.

Nothing, therefore, will be gained by the presence of the elements in the soul, unless there be also present there the various formulae of proportion and the various compositions in accordance with them. Each element will indeed know its fellow outside, but there will be no knowledge of bone or man, unless they too are present in the constitution of the soul. The impossibility of this needs no pointing out; for who would suggest that stone or man could enter into the constitution of the soul? The same applies to 'the good' and 'the not-good', and so on.

Further, the word ‘is’ has many meanings: it may be used of a ‘this’ or substance, or of a quantum, or of a quale, or of any other of the kinds of predicates we have distinguished. Does the soul consist of all of these or not? It does not appear that all have common elements. Is the soul formed out of those elements alone which enter into substances? so how will it be able to know each of the other kinds of thing? Will it be said that each kind of thing has elements or principles of its own, and that the soul is formed out of the whole of these? In that case, the soul must be a quantum and a quale and a substance. But all that can be made out of the elements of a quantum is a quantum, not a substance. These (and others like them) are the consequences of the view that the soul is composed of all the elements.

It is absurd, also, to say both (a) that like is not capable of being affected by like, and (b) that like is perceived or known by like, for perceiving, and also both thinking and knowing, are, on their own assumption, ways of being affected or moved.

There are many puzzles and difficulties raised by saying, as Empedocles does, that each set of things is known by means of its corporeal elements and by reference to something in soul which is like them, and additional testimony is furnished by this new consideration; for all the parts of the animal body which consist wholly of earth such as bones, sinews, and hair seem to be wholly insensitive and consequently not perceptive even of objects earthy like themselves, as they ought to have been.

Further, each of the principles will have far more ignorance than knowledge, for though each of them will know one thing, there will be many of which it will be ignorant. Empedocles at any rate must conclude that his God is the least intelligent of all beings, for of him alone is it true that there is one thing, Strife,

which he does not know, while there is nothing which mortal beings do not know, for ere is nothing which does not enter into their composition.

In general, we may ask, Why has not everything a soul, since everything either is an element, or is formed out of one or several or all of the elements? Each must certainly know one or several or all.

The problem might also be raised, What is that which unifies the elements into a soul? The elements correspond, it would appear, to the matter; what unites them, whatever it is, is the supremely important factor. But it is impossible that there should be something superior to, and dominant over, the soul (and a fortiori over the mind); it is reasonable to hold that mind is by nature most primordial and dominant, while their statement that it is the elements which are first of all that is.

All, both those who assert that the soul, because of its knowledge or perception of what is compounded out of the elements, and is those who assert that it is of all things the most originative of movement, fail to take into consideration all kinds of soul. In fact (1) not all beings that perceive can originate movement; there appear to be certain animals which stationary, and yet local movement is the only one, so it seems, which the soul originates in animals. And (2) the same objection holds against all those who construct mind and the perceptive faculty out of the elements; for it appears that plants live, and yet are not endowed with locomotion or perception, while a large number of animals are without discourse of reason. Even if these points were waived and mind admitted to be a part of the soul (and so too the perceptive faculty), still, even so, there would be kinds and parts of soul of which they had failed to give any account.

The same objection lies against the view expressed in the 'Orphic' poems: there it is said that the soul comes in from the whole when breathing takes place, being borne in upon the winds. Now this cannot take place in the case of plants, nor indeed in the case of certain classes of animal, for not all classes of animal breathe. This fact has escaped the notice of the holders of this view.

If we must construct the soul out of the elements, there is no necessity to suppose that all the elements enter into its construction; one element in each pair of contraries will suffice to enable it to know both that element itself and its contrary. By means of the straight line we know both itself and the curved – the carpenter's rule enables us to test both – but what is curved does not enable us to distinguish either itself or the straight. Certain thinkers say that soul is intermingled in the whole universe, and it is perhaps for that reason that Thales came to the opinion that all things are full of gods. This presents some difficulties: Why does the soul when it resides in air or fire not form an animal, while it does so when it resides in mixtures of the elements, and that although it is held to be of higher quality when contained in the former? (One might add the question, why the soul in air is maintained to be higher and more immortal than that in animals.) Both possible ways of replying to the former question lead to absurdity or paradox; for it is beyond paradox to say that fire or air is an animal, and it is absurd to refuse the name of animal to what has soul in it. The opinion that the elements have soul in them seems to have arisen from the doctrine that a whole must be homogeneous with its parts. If it is true that animals become animate by drawing into themselves a portion of what surrounds them, the partisans of this view are bound to say that the soul of the Whole too is homogeneous with all its parts. If the air sucked in is homogeneous, but soul heterogeneous, clearly while some part of soul will exist in the inbreathed air, some other part will

not. The soul must either be homogeneous, or such that there are some parts of the Whole in which it is not to be found.

From what has been said it is now clear that knowing as an attribute of soul cannot be explained by soul's being composed of the elements, and that it is neither sound nor true to speak of soul as moved. But since (a) knowing, perceiving, opining, and further (b) desiring, wishing, and generally all other modes of appetition, belong to soul, and (c) the local movements of animals, and (d) growth, maturity, and decay are produced by the soul, we must ask whether each of these is an attribute of the soul as a whole, i.e. whether it is with the whole soul we think, perceive, move ourselves, act or are acted upon, or whether each of them requires a different part of the soul? So too with regard to life. Does it depend on one of the parts of soul? Or is it dependent on more than one? Or on all? Or has it some quite other cause?

Some hold that the soul is divisible, and that one part thinks, another desires. If, then, its nature admits of its being divided, what can it be that holds the parts together? Surely not the body; on the contrary it seems rather to be the soul that holds the body together; at any rate when the soul departs the body disintegrates and decays. If, then, there is something else which makes the soul one, this unifying agency would have the best right to the name of soul, and we shall have to repeat for it the question: Is it one or multipartite? If it is one, why not at once admit that 'the soul' is one? If it has parts, once more the question must be put: What holds its parts together, and so ad infinitum?

The question might also be raised about the parts of the soul: What is the separate role of each in relation to the body? For, if the whole soul holds together the whole body, we should expect each part of the soul to hold together a part of the body. But this

seems an impossibility; it is difficult even to imagine what sort of bodily part mind will hold together, or how it will do this.

It is a fact of observation that plants and certain insects go on living when divided into segments; this means that each of the segments has a soul in it identical in species, though not numerically identical in the different segments, for both of the segments for a time possess the power of sensation and local movement. That this does not last is not surprising, for they no longer possess the organs necessary for self-maintenance. But, all the same, in each of the bodily parts there are present all the parts of soul, and the souls so present are homogeneous with one another and with the whole; this means that the several parts of the soul are indisseverable from one another, although the whole soul is divisible. It seems also that the principle found in plants is also a kind of soul; for this is the only principle which is common to both animals and plants; and this exists in isolation from the principle of sensation, though there nothing which has the latter without the former.

Book II

1

Let the foregoing suffice as our account of the views concerning the soul which have been handed on by our predecessors; let us now dismiss them and make as it were a completely fresh start,

endeavouring to give a precise answer to the question, What is soul? i.e. to formulate the most general possible definition of it.

We are in the habit of recognizing, as one determinate kind of what is, substance, and that in several senses, (a) in the sense of matter or that which in itself is not ‘a this’, and (b) in the sense of form or essence, which is that precisely in virtue of which a thing is called ‘a this’, and thirdly (c) in the sense of that which is compounded of both (a) and (b). Now matter is potentiality, form actuality; of the latter there are two grades related to one another as e.g. knowledge to the exercise of knowledge.

Among substances are by general consent reckoned bodies and especially natural bodies; for they are the principles of all other bodies. Of natural bodies some have life in them, others not; by life we mean self-nutrition and growth (with its correlative decay). It follows that every natural body which has life in it is a substance in the sense of a composite.

But since it is also a body of such and such a kind, viz. having life, the body cannot be soul; the body is the subject or matter, not what is attributed to it. Hence the soul must be a substance in the sense of the form of a natural body having life potentially within it. But substance is actuality, and thus soul is the actuality of a body as above characterized. Now the word actuality has two senses corresponding respectively to the possession of knowledge and the actual exercise of knowledge. It is obvious that the soul is actuality in the first sense, viz. that of knowledge as possessed, for both sleeping and waking presuppose the existence of soul, and of these waking corresponds to actual knowing, sleeping to knowledge possessed but not employed, and, in the history of the individual, knowledge comes before its employment or exercise.

That is why the soul is the first grade of actuality of a natural body having life potentially in it. The body so described is a body

which is organized. The parts of plants in spite of their extreme simplicity are 'organs'; e.g. the leaf serves to shelter the pericarp, the pericarp to shelter the fruit, while the roots of plants are analogous to the mouth of animals, both serving for the absorption of food. If, then, we have to give a general formula applicable to all kinds of soul, we must describe it as the first grade of actuality of a natural organized body. That is why we can wholly dismiss as unnecessary the question whether the soul and the body are one: it is as meaningless as to ask whether the wax and the shape given to it by the stamp are one, or generally the matter of a thing and that of which it is the matter. Unity has many senses (as many as 'is' has), but the most proper and fundamental sense of both is the relation of an actuality to that of which it is the actuality. We have now given an answer to the question, what is soul? – an answer which applies to it in its full extent. It is substance in the sense which corresponds to the definitive formula of a thing's essence. That means that it is 'the essential whatness' of a body of the character just assigned. Suppose that what is literally an 'organ', like an axe, were a natural body, its 'essential whatness', would have been its essence, and so its soul; if this disappeared from it, it would have ceased to be an axe, except in name. As it is, it is just an axe; it wants the character which is required to make its whatness or formulable essence a soul; for that, it would have had to be a natural body of a particular kind, viz. one having in itself the power of setting itself in movement and arresting itself. Next, apply this doctrine in the case of the 'parts' of the living body. Suppose that the eye were an animal-sight would have been its soul, for sight is the substance or essence of the eye which corresponds to the formula, the eye being merely the matter of seeing; when seeing is removed the eye is no longer an eye, except in name – it is no more a real eye than the eye of a statue or of a painted figure. We must now extend our consideration from the 'parts' to the whole living

body; for what the departmental sense is to the bodily part which is its organ, that the whole faculty of sense is to the whole sensitive body as such.

We must not understand by that which is 'potentially capable of living' what has lost the soul it had, but only what still retains it; but seeds and fruits are bodies which possess the qualification. Consequently, while waking is actuality in a sense corresponding to the cutting and the seeing, the soul is actuality in the sense corresponding to the power of sight and the power in the tool; the body corresponds to what exists in potentiality; as the pupil plus the power of sight constitutes the eye, so the soul plus the body constitutes the animal.

From this it indubitably follows that the soul is inseparable from its body, or at any rate that certain parts of it are (if it has parts) for the actuality of some of them is nothing but the actualities of their bodily parts. Yet some may be separable because they are not the actualities of any body at all. Further, we have no light on the problem whether the soul may not be the actuality of its body in the sense in which the sailor is the actuality of the ship.

This must suffice as our sketch or outline determination of the nature of soul.

2

Since what is clear or logically more evident emerges from what in itself is confused but more observable by us, we must reconsider our results from this point of view. For it is not enough for a definitive formula to express as most now do the mere fact; it must include and exhibit the ground also. At

present definitions are given in a form analogous to the conclusion of a syllogism; e.g. What is squaring? The construction of an equilateral rectangle equal to a given oblong rectangle. Such a definition is in form equivalent to a conclusion. One that tells us that squaring is the discovery of a line which is a mean proportional between the two unequal sides of the given rectangle discloses the ground of what is defined.

We resume our inquiry from a fresh starting-point by calling attention to the fact that what has soul in it differs from what has not, in that the former displays life. Now this word has more than one sense, and provided any one alone of these is found in a thing we say that thing is living. Living, that is, may mean thinking or perception or local movement and rest, or movement in the sense of nutrition, decay and growth. Hence we think of plants also as living, for they are observed to possess in themselves an originative power through which they increase or decrease in all spatial directions; they grow up and down, and everything that grows increases its bulk alike in both directions or indeed in all, and continues to live so long as it can absorb nutriment.

This power of self-nutrition can be isolated from the other powers mentioned, but not they from it – in mortal beings at least. The fact is obvious in plants; for it is the only psychic power they possess.

This is the originative power the possession of which leads us to speak of things as living at all, but it is the possession of sensation that leads us for the first time to speak of living things as animals; for even those beings which possess no power of local movement but do possess the power of sensation we call animals and not merely living things.

The primary form of sense is touch, which belongs to all animals. just as the power of self-nutrition can be isolated from touch and sensation generally, so touch can be isolated from all other forms of sense. (By the power of self-nutrition we mean that departmental power of the soul which is common to plants and animals: all animals whatsoever are observed to have the sense of touch.) What the explanation of these two facts is, we must discuss later. At present we must confine ourselves to saying that soul is the source of these phenomena and is characterized by them, viz. by the powers of self-nutrition, sensation, thinking, and motivity.

Is each of these a soul or a part of a soul? And if a part, a part in what sense? A part merely distinguishable by definition or a part distinct in local situation as well? In the case of certain of these powers, the answers to these questions are easy, in the case of others we are puzzled what to say. just as in the case of plants which when divided are observed to continue to live though removed to a distance from one another (thus showing that in their case the soul of each individual plant before division was actually one, potentially many), so we notice a similar result in other varieties of soul, i.e. in insects which have been cut in two; each of the segments possesses both sensation and local movement; and if sensation, necessarily also imagination and appetition; for, where there is sensation, there is also pleasure and pain, and, where these, necessarily also desire.

We have no evidence as yet about mind or the power to think; it seems to be a widely different kind of soul, differing as what is eternal from what is perishable; it alone is capable of existence in isolation from all other psychic powers. All the other parts of soul, it is evident from what we have said, are, in spite of certain statements to the contrary, incapable of separate existence though, of course, distinguishable by definition. If opining is

distinct from perceiving, to be capable of opining and to be capable of perceiving must be distinct, and so with all the other forms of living above enumerated. Further, some animals possess all these parts of soul, some certain of them only, others one only (this is what enables us to classify animals); the cause must be considered later.' A similar arrangement is found also within the field of the senses; some classes of animals have all the senses, some only certain of them, others only one, the most indispensable, touch.

Since the expression 'that whereby we live and perceive' has two meanings, just like the expression 'that whereby we know' – that may mean either (a) knowledge or (b) the soul, for we can speak of knowing by or with either, and similarly that whereby we are in health may be either (a) health or (b) the body or some part of the body; and since of the two terms thus contrasted knowledge or health is the name of a form, essence, or ratio, or if we so express it an actuality of a recipient matter – knowledge of what is capable of knowing, health of what is capable of being made healthy (for the operation of that which is capable of originating change terminates and has its seat in what is changed or altered); further, since it is the soul by or with which primarily we live, perceive, and think: – it follows that the soul must be a ratio or formulable essence, not a matter or subject. For, as we said, word substance has three meanings form, matter, and the complex of both and of these three what is called matter is potentiality, what is called form actuality. Since then the complex here is the living thing, the body cannot be the actuality of the soul; it is the soul which is the actuality of a certain kind of body. Hence the rightness of the view that the soul cannot be without a body, while it csnnot he a body; it is not a body but something relative to a body. That is why it is in a body, and a body of a definite kind. It was a mistake, therefore, to do as former thinkers did, merely to fit it into a body without adding a definite specification of the kind or character of that

body. Reflection confirms the observed fact; the actuality of any given thing can only be realized in what is already potentially that thing, i.e. in a matter of its own appropriate to it. From all this it follows that soul is an actuality or formulable essence of something that possesses a potentiality of being besouled.

3

Of the psychic powers above enumerated some kinds of living things, as we have said, possess all, some less than all, others one only. Those we have mentioned are the nutritive, the appetitive, the sensory, the locomotive, and the power of thinking. Plants have none but the first, the nutritive, while another order of living things has this plus the sensory. If any order of living things has the sensory, it must also have the appetitive; for appetite is the genus of which desire, passion, and wish are the species; now all animals have one sense at least, viz. touch, and whatever has a sense has the capacity for pleasure and pain and therefore has pleasant and painful objects present to it, and wherever these are present, there is desire, for desire is just appetition of what is pleasant. Further, all animals have the sense for food (for touch is the sense for food); the food of all living things consists of what is dry, moist, hot, cold, and these are the qualities apprehended by touch; all other sensible qualities are apprehended by touch only indirectly. Sounds, colours, and odours contribute nothing to nutriment; flavours fall within the field of tangible qualities. Hunger and thirst are forms of desire, hunger a desire for what is dry and hot, thirst a desire for what is cold and moist; flavour is a sort of seasoning added to both. We must later clear up these points, but at present it may be enough to say that all animals that possess the sense of touch have also appetition.

The case of imagination is obscure; we must examine it later. Certain kinds of animals possess in addition the power of locomotion, and still another order of animate beings, i.e. man and possibly another order like man or superior to him, the power of thinking, i.e. mind. It is now evident that a single definition can be given of soul only in the same sense as one can be given of figure. For, as in that case there is no figure distinguishable and apart from triangle, &c., so here there is no soul apart from the forms of soul just enumerated. It is true that a highly general definition can be given for figure which will fit all figures without expressing the peculiar nature of any figure. So here in the case of soul and its specific forms. Hence it is absurd in this and similar cases to demand an absolutely general definition which will fail to express the peculiar nature of anything that is, or again, omitting this, to look for separate definitions corresponding to each infima species. The cases of figure and soul are exactly parallel; for the particulars subsumed under the common name in both cases – figures and living beings – constitute a series, each successive term of which potentially contains its predecessor, e.g. the square the triangle, the sensory power the self-nutritive. Hence we must ask in the case of each order of living things, What is its soul, i.e. What is the soul of plant, animal, man? Why the terms are related in this serial way must form the subject of later examination. But the facts are that the power of perception is never found apart from the power of self-nutrition, while – in plants – the latter is found isolated from the former. Again, no sense is found apart from that of touch, while touch is found by itself; many animals have neither sight, hearing, nor smell. Again, among living things that possess sense some have the power of locomotion, some not. Lastly, certain living beings – a small minority – possess calculation and thought, for (among mortal beings) those which possess calculation have all the other powers above mentioned, while the converse does not

hold – indeed some live by imagination alone, while others have not even imagination. The mind that knows with immediate intuition presents a different problem.

It is evident that the way to give the most adequate definition of soul is to seek in the case of each of its forms for the most appropriate definition.

4

It is necessary for the student of these forms of soul first to find a definition of each, expressive of what it is, and then to investigate its derivative properties, &c. But if we are to express what each is, viz. what the thinking power is, or the perceptive, or the nutritive, we must go farther back and first give an account of thinking or perceiving, for in the order of investigation the question of what an agent does precedes the question, what enables it to do what it does. If this is correct, we must on the same ground go yet another step farther back and have some clear view of the objects of each; thus we must start with these objects, e.g. with food, with what is perceptible, or with what is intelligible.

It follows that first of all we must treat of nutrition and reproduction, for the nutritive soul is found along with all the others and is the most primitive and widely distributed power of soul, being indeed that one in virtue of which all are said to have life. The acts in which it manifests itself are reproduction and the use of food – reproduction, I say, because for any living thing that has reached its normal development and which is unmutilated, and whose mode of generation is not spontaneous, the most natural act is the production of another like itself, an animal producing an animal, a plant a plant, in

order that, as far as its nature allows, it may partake in the eternal and divine. That is the goal towards which all things strive, that for the sake of which they do whatsoever their nature renders possible. The phrase 'for the sake of which' is ambiguous; it may mean either (a) the end to achieve which, or (b) the being in whose interest, the act is done. Since then no living thing is able to partake in what is eternal and divine by uninterrupted continuance (for nothing perishable can for ever remain one and the same), it tries to achieve that end in the only way possible to it, and success is possible in varying degrees; so it remains not indeed as the self-same individual but continues its existence in something like itself – not numerically but specifically one.

The soul is the cause or source of the living body. The terms cause and source have many senses. But the soul is the cause of its body alike in all three senses which we explicitly recognize. It is (a) the source or origin of movement, it is (b) the end, it is (c) the essence of the whole living body.

That it is the last, is clear; for in everything the essence is identical with the ground of its being, and here, in the case of living things, their being is to live, and of their being and their living the soul in them is the cause or source. Further, the actuality of whatever is potential is identical with its formulable essence.

It is manifest that the soul is also the final cause of its body. For Nature, like mind, always does whatever it does for the sake of something, which something is its end. To that something corresponds in the case of animals the soul and in this it follows the order of nature; all natural bodies are organs of the soul. This is true of those that enter into the constitution of plants as well as of those which enter into that of animals. This shows that that the sake of which they are is soul. We must

here recall the two senses of 'that for the sake of which', viz. (a) the end to achieve which, and (b) the being in whose interest, anything is or is done.

We must maintain, further, that the soul is also the cause of the living body as the original source of local movement. The power of locomotion is not found, however, in all living things. But change of quality and change of quantity are also due to the soul. Sensation is held to be a qualitative alteration, and nothing except what has soul in it is capable of sensation. The same holds of the quantitative changes which constitute growth and decay; nothing grows or decays naturally except what feeds itself, and nothing feeds itself except what has a share of soul in it.

Empedocles is wrong in adding that growth in plants is to be explained, the downward rooting by the natural tendency of earth to travel downwards, and the upward branching by the similar natural tendency of fire to travel upwards. For he misinterprets up and down; up and down are not for all things what they are for the whole Cosmos: if we are to distinguish and identify organs according to their functions, the roots of plants are analogous to the head in animals. Further, we must ask what is the force that holds together the earth and the fire which tend to travel in contrary directions; if there is no counteracting force, they will be torn asunder; if there is, this must be the soul and the cause of nutrition and growth. By some the element of fire is held to be the cause of nutrition and growth, for it alone of the primary bodies or elements is observed to feed and increase itself. Hence the suggestion that in both plants and animals it is it which is the operative force. A concurrent cause in a sense it certainly is, but not the principal cause, that is rather the soul; for while the growth of fire goes on without limit so long as there is a supply of fuel, in the case of all complex wholes formed in the course of nature there is a

limit or ratio which determines their size and increase, and limit and ratio are marks of soul but not of fire, and belong to the side of formulable essence rather than that of matter.

Nutrition and reproduction are due to one and the same psychic power. It is necessary first to give precision to our account of food, for it is by this function of absorbing food that this psychic power is distinguished from all the others. The current view is that what serves as food to a living thing is what is contrary to it – not that in every pair of contraries each is food to the other: to be food a contrary must not only be transformable into the other and vice versa, it must also in so doing increase the bulk of the other. Many a contrary is transformed into its other and vice versa, where neither is even a quantum and so cannot increase in bulk, e.g. an invalid into a healthy subject. It is clear that not even those contraries which satisfy both the conditions mentioned above are food to one another in precisely the same sense; water may be said to feed fire, but not fire water. Where the members of the pair are elementary bodies only one of the contraries, it would appear, can be said to feed the other. But there is a difficulty here. One set of thinkers assert that like fed, as well as increased in amount, by like. Another set, as we have said, maintain the very reverse, viz. that what feeds and what is fed are contrary to one another; like, they argue, is incapable of being affected by like; but food is changed in the process of digestion, and change is always to what is opposite or to what is intermediate. Further, food is acted upon by what is nourished by it, not the other way round, as timber is worked by a carpenter and not conversely; there is a change in the carpenter but it is merely a change from not-working to working. In answering this problem it makes all the difference whether we mean by ‘the food’ the ‘finished’ or the ‘raw’ product. If we use the word food of both, viz. of the completely undigested and the completely digested matter, we can justify both the rival accounts of it; taking food in the sense of undigested matter, it

is the contrary of what is fed by it, taking it as digested it is like what is fed by it. Consequently it is clear that in a certain sense we may say that both parties are right, both wrong.

Since nothing except what is alive can be fed, what is fed is the besouled body and just because it has soul in it. Hence food is essentially related to what has soul in it. Food has a power which is other than the power to increase the bulk of what is fed by it; so far forth as what has soul in it is a quantum, food may increase its quantity, but it is only so far as what has soul in it is a 'this-somewhat' or substance that food acts as food; in that case it maintains the being of what is fed, and that continues to be what it is so long as the process of nutrition continues. Further, it is the agent in generation, i.e. not the generation of the individual fed but the reproduction of another like it; the substance of the individual fed is already in existence; the existence of no substance is a self-generation but only a self-maintenance.

Hence the psychic power which we are now studying may be described as that which tends to maintain whatever has this power in it of continuing such as it was, and food helps it to do its work. That is why, if deprived of food, it must cease to be.

The process of nutrition involves three factors, (a) what is fed, (b) that wherewith it is fed, (c) what does the feeding; of these (c) is the first soul, (a) the body which has that soul in it, (b) the food. But since it is right to call things after the ends they realize, and the end of this soul is to generate another being like that in which it is, the first soul ought to be named the reproductive soul. The expression (b) 'wherewith it is fed' is ambiguous just as is the expression 'wherewith the ship is steered'; that may mean either (i) the hand or (ii) the rudder, i.e. either (i) what is moved and sets in movement, or (ii) what is merely moved. We can apply this analogy here if we recall that

all food must be capable of being digested, and that what produces digestion is warmth; that is why everything that has soul in it possesses warmth.

We have now given an outline account of the nature of food; further details must be given in the appropriate place.

5

Having made these distinctions let us now speak of sensation in the widest sense. Sensation depends, as we have said, on a process of movement or affection from without, for it is held to be some sort of change of quality. Now some thinkers assert that like is affected only by like; in what sense this is possible and in what sense impossible, we have explained in our general discussion of acting and being acted upon.

Here arises a problem: why do we not perceive the senses themselves as well as the external objects of sense, or why without the stimulation of external objects do they not produce sensation, seeing that they contain in themselves fire, earth, and all the other elements, which are the direct or indirect objects is so of sense? It is clear that what is sensitive is only potentially, not actually. The power of sense is parallel to what is combustible, for that never ignites itself spontaneously, but requires an agent which has the power of starting ignition; otherwise it could have set itself on fire, and would not have needed actual fire to set it ablaze.

In reply we must recall that we use the word 'perceive' in two ways, for we say (a) that what has the power to hear or see, 'sees' or 'hears', even though it is at the moment asleep, and also (b) that what is actually seeing or hearing, 'sees' or 'hears'.

Hence ‘sense’ too must have two meanings, sense potential, and sense actual. Similarly ‘to be a sentient’ means either (a) to have a certain power or (b) to manifest a certain activity. To begin with, for a time, let us speak as if there were no difference between (i) being moved or affected, and (ii) being active, for movement is a kind of activity – an imperfect kind, as has elsewhere been explained. Everything that is acted upon or moved is acted upon by an agent which is actually at work. Hence it is that in one sense, as has already been stated, what acts and what is acted upon are like, in another unlike, i.e. prior to and during the change the two factors are unlike, after it like.

But we must now distinguish not only between what is potential and what is actual but also different senses in which things can be said to be potential or actual; up to now we have been speaking as if each of these phrases had only one sense. We can speak of something as ‘a knower’ either (a) as when we say that man is a knower, meaning that man falls within the class of beings that know or have knowledge, or (b) as when we are speaking of a man who possesses a knowledge of grammar; each of these is so called as having in him a certain potentiality, but there is a difference between their respective potentialities, the one (a) being a potential knower, because his kind or matter is such and such, the other (b), because he can in the absence of any external counteracting cause realize his knowledge in actual knowing at will. This implies a third meaning of ‘a knower’ (c), one who is already realizing his knowledge – he is a knower in actuality and in the most proper sense is knowing, e.g. this A. Both the former are potential knowers, who realize their respective potentialities, the one (a) by change of quality, i.e. repeated transitions from one state to its opposite under instruction, the other (b) by the transition from the inactive possession of sense or grammar to their active exercise. The two kinds of transition are distinct.

Also the expression ‘to be acted upon’ has more than one meaning; it may mean either (a) the extinction of one of two contraries by the other, or (b) the maintenance of what is potential by the agency of what is actual and already like what is acted upon, with such likeness as is compatible with one’s being actual and the other potential. For what possesses knowledge becomes an actual knower by a transition which is either not an alteration of it at all (being in reality a development into its true self or actuality) or at least an alteration in a quite different sense from the usual meaning.

Hence it is wrong to speak of a wise man as being ‘altered’ when he uses his wisdom, just as it would be absurd to speak of a builder as being altered when he is using his skill in building a house.

What in the case of knowing or understanding leads from potentiality to actuality ought not to be called teaching but something else. That which starting with the power to know learns or acquires knowledge through the agency of one who actually knows and has the power of teaching either (a) ought not to be said ‘to be acted upon’ at all or (b) we must recognize two senses of alteration, viz. (i) the substitution of one quality for another, the first being the contrary of the second, or (ii) the development of an existent quality from potentiality in the direction of fixity or nature.

In the case of what is to possess sense, the first transition is due to the action of the male parent and takes place before birth so that at birth the living thing is, in respect of sensation, at the stage which corresponds to the possession of knowledge. Actual sensation corresponds to the stage of the exercise of knowledge. But between the two cases compared there is a difference; the objects that excite the sensory powers to activity, the seen, the heard, &c., are outside. The ground of this difference is that

what actual sensation apprehends is individuals, while what knowledge apprehends is universals, and these are in a sense within the soul. That is why a man can exercise his knowledge when he wishes, but his sensation does not depend upon himself a sensible object must be there. A similar statement must be made about our knowledge of what is sensible – on the same ground, viz. that the sensible objects are individual and external.

A later more appropriate occasion may be found thoroughly to clear up all this. At present it must be enough to recognize the distinctions already drawn; a thing may be said to be potential in either of two senses, (a) in the sense in which we might say of a boy that he may become a general or (b) in the sense in which we might say the same of an adult, and there are two corresponding senses of the term 'a potential sentient'. There are no separate names for the two stages of potentiality; we have pointed out that they are different and how they are different. We cannot help using the incorrect terms 'being acted upon or altered' of the two transitions involved. As we have said, has the power of sensation is potentially like what the perceived object is actually; that is, while at the beginning of the process of its being acted upon the two interacting factors are dissimilar, at the end the one acted upon is assimilated to the other and is identical in quality with it.

6

In dealing with each of the senses we shall have first to speak of the objects which are perceptible by each. The term 'object of sense' covers three kinds of objects, two kinds of which are, in our language, directly perceptible, while the remaining one is

only incidentally perceptible. Of the first two kinds one (a) consists of what is perceptible by a single sense, the other (b) of what is perceptible by any and all of the senses. I call by the name of special object of this or that sense that which cannot be perceived by any other sense than that one and in respect of which no error is possible; in this sense colour is the special object of sight, sound of hearing, flavour of taste. Touch, indeed, discriminates more than one set of different qualities. Each sense has one kind of object which it discerns, and never errs in reporting that what is before it is colour or sound (though it may err as to what it is that is coloured or where that is, or what it is that is sounding or where that is.) Such objects are what we propose to call the special objects of this or that sense.

'Common sensibles' are movement, rest, number, figure, magnitude; these are not peculiar to any one sense, but are common to all. There are at any rate certain kinds of movement which are perceptible both by touch and by sight.

We speak of an incidental object of sense where e.g. the white object which we see is the son of Diares; here because 'being the son of Diares' is incidental to the directly visible white patch we speak of the son of Diares as being (incidentally) perceived or seen by us. Because this is only incidentally an object of sense, it in no way as such affects the senses. Of the two former kinds, both of which are in their own nature perceptible by sense, the first kind – that of special objects of the several senses – constitute the objects of sense in the strictest sense of the term and it is to them that in the nature of things the structure of each several sense is adapted.

7

The object of sight is the visible, and what is visible is (a) colour and (b) a certain kind of object which can be described in words but which has no single name; what we mean by (b) will be abundantly clear as we proceed. Whatever is visible is colour and colour is what lies upon what is in its own nature visible; 'in its own nature' here means not that visibility is involved in the definition of what thus underlies colour, but that that substratum contains in itself the cause of visibility. Every colour has in it the power to set in movement what is actually transparent; that power constitutes its very nature. That is why it is not visible except with the help of light; it is only in light that the colour of a thing is seen. Hence our first task is to explain what light is.

Now there clearly is something which is transparent, and by 'transparent' I mean what is visible, and yet not visible in itself, but rather owing its visibility to the colour of something else; of this character are air, water, and many solid bodies. Neither air nor water is transparent because it is air or water; they are transparent because each of them has contained in it a certain substance which is the same in both and is also found in the eternal body which constitutes the uppermost shell of the physical Cosmos. Of this substance light is the activity – the activity of what is transparent so far forth as it has in it the determinate power of becoming transparent; where this power is present, there is also the potentiality of the contrary, viz. darkness. Light is as it were the proper colour of what is transparent, and exists whenever the potentially transparent is excited to actuality by the influence of fire or something resembling 'the uppermost body'; for fire too contains something which is one and the same with the substance in question.

We have now explained what the transparent is and what light is; light is neither fire nor any kind whatsoever of body nor an efflux from any kind of body (if it were, it would again itself be a kind of body) – it is the presence of fire or something resembling fire in what is transparent. It is certainly not a body, for two bodies cannot be present in the same place. The opposite of light is darkness; darkness is the absence from what is transparent of the corresponding positive state above characterized; clearly therefore, light is just the presence of that.

Empedocles (and with him all others who used the same forms of expression) was wrong in speaking of light as 'travelling' or being at a given moment between the earth and its envelope, its movement being unobservable by us; that view is contrary both to the clear evidence of argument and to the observed facts; if the distance traversed were short, the movement might have been unobservable, but where the distance is from extreme East to extreme West, the draught upon our powers of belief is too great.

What is capable of taking on colour is what in itself is colourless, as what can take on sound is what is soundless; what is colourless includes (a) what is transparent and (b) what is invisible or scarcely visible, i.e. what is 'dark'. The latter (b) is the same as what is transparent, when it is potentially, not of course when it is actually transparent; it is the same substance which is now darkness, now light.

Not everything that is visible depends upon light for its visibility. This is only true of the 'proper' colour of things. Some objects of sight which in light are invisible, in darkness stimulate the sense; that is, things that appear fiery or shining. This class of objects has no simple common name, but instances of it are fungi, flesh, heads, scales, and eyes of fish. In

none of these is what is seen their own proper' colour. Why we see these at all is another question. At present what is obvious is that what is seen in light is always colour. That is why without the help of light colour remains invisible. Its being colour at all means precisely its having in it the power to set in movement what is already actually transparent, and, as we have seen, the actuality of what is transparent is just light.

The following experiment makes the necessity of a medium clear. If what has colour is placed in immediate contact with the eye, it cannot be seen. Colour sets in movement not the sense organ but what is transparent, e.g. the air, and that, extending continuously from the object to the organ, sets the latter in movement. Democritus misrepresents the facts when he expresses the opinion that if the interspace were empty one could distinctly see an ant on the vault of the sky; that is an impossibility. Seeing is due to an affection or change of what has the perceptive faculty, and it cannot be affected by the seen colour itself; it remains that it must be affected by what comes between. Hence it is indispensable that there be something in between – if there were nothing, so far from seeing with greater distinctness, we should see nothing at all.

We have now explained the cause why colour cannot be seen otherwise than in light. Fire on the other hand is seen both in darkness and in light; this double possibility follows necessarily from our theory, for it is just fire that makes what is potentially transparent actually transparent.

The same account holds also of sound and smell; if the object of either of these senses is in immediate contact with the organ no sensation is produced. In both cases the object sets in movement only what lies between, and this in turn sets the organ in movement: if what sounds or smells is brought into immediate contact with the organ, no sensation will be

produced. The same, in spite of all appearances, applies also to touch and taste; why there is this apparent difference will be clear later. What comes between in the case of sounds is air; the corresponding medium in the case of smell has no name. But, corresponding to what is transparent in the case of colour, there is a quality found both in air and water, which serves as a medium for what has smell – I say 'in water' because animals that live in water as well as those that live on land seem to possess the sense of smell, and 'in air' because man and all other land animals that breathe, perceive smells only when they breathe air in. The explanation of this too will be given later.

8

Now let us, to begin with, make certain distinctions about sound and hearing.

Sound may mean either of two things (a) actual, and (b) potential, sound. There are certain things which, as we say, 'have no sound', e.g. sponges or wool, others which have, e.g. bronze and in general all things which are smooth and solid – the latter are said to have a sound because they can make a sound, i.e. can generate actual sound between themselves and the organ of hearing.

Actual sound requires for its occurrence (i, ii) two such bodies and (iii) a space between them; for it is generated by an impact. Hence it is impossible for one body only to generate a sound – there must be a body impinging and a body impinged upon; what sounds does so by striking against something else, and this is impossible without a movement from place to place.

As we have said, not all bodies can by impact on one another produce sound; impact on wool makes no sound, while the impact on bronze or any body which is smooth and hollow does. Bronze gives out a sound when struck because it is smooth; bodies which are hollow owing to reflection repeat the original impact over and over again, the body originally set in movement being unable to escape from the concavity.

Further, we must remark that sound is heard both in air and in water, though less distinctly in the latter. Yet neither air nor water is the principal cause of sound. What is required for the production of sound is an impact of two solids against one another and against the air. The latter condition is satisfied when the air impinged upon does not retreat before the blow, i.e. is not dissipated by it.

That is why it must be struck with a sudden sharp blow, if it is to sound – the movement of the whip must outrun the dispersion of the air, just as one might get in a stroke at a heap or whirl of sand as it was traveling rapidly past.

An echo occurs, when, a mass of air having been unified, bounded, and prevented from dissipation by the containing walls of a vessel, the air originally struck by the impinging body and set in movement by it rebounds from this mass of air like a ball from a wall. It is probable that in all generation of sound echo takes place, though it is frequently only indistinctly heard. What happens here must be analogous to what happens in the case of light; light is always reflected – otherwise it would not be diffused and outside what was directly illuminated by the sun there would be blank darkness; but this reflected light is not always strong enough, as it is when it is reflected from water, bronze, and other smooth bodies, to cast a shadow, which is the distinguishing mark by which we recognize light.

It is rightly said that an empty space plays the chief part in the production of hearing, for what people mean by 'the vacuum' is the air, which is what causes hearing, when that air is set in movement as one continuous mass; but owing to its friability it emits no sound, being dissipated by impinging upon any surface which is not smooth. When the surface on which it impinges is quite smooth, what is produced by the original impact is a united mass, a result due to the smoothness of the surface with which the air is in contact at the other end.

What has the power of producing sound is what has the power of setting in movement a single mass of air which is continuous from the impinging body up to the organ of hearing. The organ of hearing is physically united with air, and because it is in air, the air inside is moved concurrently with the air outside. Hence animals do not hear with all parts of their bodies, nor do all parts admit of the entrance of air; for even the part which can be moved and can sound has not air everywhere in it. Air in itself is, owing to its friability, quite soundless; only when its dissipation is prevented is its movement sound. The air in the ear is built into a chamber just to prevent this dissipating movement, in order that the animal may accurately apprehend all varieties of the movements of the air outside. That is why we hear also in water, viz. because the water cannot get into the air chamber or even, owing to the spirals, into the outer ear. If this does happen, hearing ceases, as it also does if the tympanic membrane is damaged, just as sight ceases if the membrane covering the pupil is damaged. It is also a test of deafness whether the ear does or does not reverberate like a horn; the air inside the ear has always a movement of its own, but the sound we hear is always the sounding of something else, not of the organ itself. That is why we say that we hear with what is empty and echoes, viz. because what we hear with is a chamber which contains a bounded mass of air.

Which is it that 'sounds', the striking body or the struck? Is not the answer 'it is both, but each in a different way'? Sound is a movement of what can rebound from a smooth surface when struck against it. As we have explained' not everything sounds when it strikes or is struck, e.g. if one needle is struck against another, neither emits any sound. In order, therefore, that sound may be generated, what is struck must be smooth, to enable the air to rebound and be shaken off from it in one piece.

The distinctions between different sounding bodies show themselves only in actual sound; as without the help of light colours remain invisible, so without the help of actual sound the distinctions between acute and grave sounds remain inaudible. Acute and grave are here metaphors, transferred from their proper sphere, viz. that of touch, where they mean respectively (a) what moves the sense much in a short time, (b) what moves the sense little in a long time. Not that what is sharp really moves fast, and what is grave, slowly, but that the difference in the qualities of the one and the other movement is due to their respective speeds. There seems to be a sort of parallelism between what is acute or grave to hearing and what is sharp or blunt to touch; what is sharp as it were stabs, while what is blunt pushes, the one producing its effect in a short, the other in a long time, so that the one is quick, the other slow.

Let the foregoing suffice as an analysis of sound. Voice is a kind of sound characteristic of what has soul in it; nothing that is without soul utters voice, it being only by a metaphor that we speak of the voice of the flute or the lyre or generally of what (being without soul) possesses the power of producing a succession of notes which differ in length and pitch and timbre. The metaphor is based on the fact that all these differences are found also in voice. Many animals are voiceless, e.g. all non-sanuineous animals and among sanguineous animals fish. This is just what we should expect, since voice is a certain

movement of air. The fish, like those in the Achelous, which are said to have voice, really make the sounds with their gills or some similar organ. Voice is the sound made by an animal, and that with a special organ. As we saw, everything that makes a sound does so by the impact of something (a) against something else, (b) across a space, (c) filled with air; hence it is only to be expected that no animals utter voice except those which take in air. Once air is inbreathed, Nature uses it for two different purposes, as the tongue is used both for tasting and for articulating; in that case of the two functions tasting is necessary for the animal's existence (hence it is found more widely distributed), while articulate speech is a luxury subserving its possessor's well-being; similarly in the former case Nature employs the breath both as an indispensable means to the regulation of the inner temperature of the living body and also as the matter of articulate voice, in the interests of its possessor's well-being. Why its former use is indispensable must be discussed elsewhere.

The organ of respiration is the windpipe, and the organ to which this is related as means to end is the lungs. The latter is the part of the body by which the temperature of land animals is raised above that of all others. But what primarily requires the air drawn in by respiration is not only this but the region surrounding the heart. That is why when animals breathe the air must penetrate inwards.

Voice then is the impact of the inbreathed air against the 'windpipe', and the agent that produces the impact is the soul resident in these parts of the body. Not every sound, as we said, made by an animal is voice (even with the tongue we may merely make a sound which is not voice, or without the tongue as in coughing); what produces the impact must have soul in it and must be accompanied by an act of imagination, for voice is a sound with a meaning, and is not merely the result of any

impact of the breath as in coughing; in voice the breath in the windpipe is used as an instrument to knock with against the walls of the windpipe. This is confirmed by our inability to speak when we are breathing either out or in – we can only do so by holding our breath; we make the movements with the breath so checked. It is clear also why fish are voiceless; they have no windpipe. And they have no windpipe because they do not breathe or take in air. Why they do not is a question belonging to another inquiry.

9

Smell and its object are much less easy to determine than what we have hitherto discussed; the distinguishing characteristic of the object of smell is less obvious than those of sound or colour. The ground of this is that our power of smell is less discriminating and in general inferior to that of many species of animals; men have a poor sense of smell and our apprehension of its proper objects is inseparably bound up with and so confused by pleasure and pain, which shows that in us the organ is inaccurate. It is probable that there is a parallel failure in the perception of colour by animals that have hard eyes: probably they discriminate differences of colour only by the presence or absence of what excites fear, and that it is thus that human beings distinguish smells. It seems that there is an analogy between smell and taste, and that the species of tastes run parallel to those of smells – the only difference being that our sense of taste is more discriminating than our sense of smell, because the former is a modification of touch, which reaches in man the maximum of discriminative accuracy. While in respect of all the other senses we fall below many species of animals, in respect of touch we far excel all other species in

exactness of discrimination. That is why man is the most intelligent of all animals. This is confirmed by the fact that it is to differences in the organ of touch and to nothing else that the differences between man and man in respect of natural endowment are due; men whose flesh is hard are ill-endowed by nature, men whose flesh is soft, wellendowed.

As flavours may be divided into (a) sweet, (b) bitter, so with smells. In some things the flavour and the smell have the same quality, i.e. both are sweet or both bitter, in others they diverge. Similarly a smell, like a flavour, may be pungent, astringent, acid, or succulent. But, as we said, because smells are much less easy to discriminate than flavours, the names of these varieties are applied to smells only metaphorically; for example 'sweet' is extended from the taste to the smell of saffron or honey, 'pungent' to that of thyme, and so on.

In the same sense in which hearing has for its object both the audible and the inaudible, sight both the visible and the invisible, smell has for its object both the odorous and the inodorous. 'Inodorous' may be either (a) what has no smell at all, or (b) what has a small or feeble smell. The same ambiguity lurks in the word 'tasteless'.

Smelling, like the operation of the senses previously examined, takes place through a medium, i.e. through air or water – I add water, because water-animals too (both sanguineous and non-sanguineous) seem to smell just as much as land-animals; at any rate some of them make directly for their food from a distance if it has any scent. That is why the following facts constitute a problem for us. All animals smell in the same way, but man smells only when he inhales; if he exhales or holds his breath, he ceases to smell, no difference being made whether the odorous object is distant or near, or even placed inside the nose and actually on the wall of the nostril; it is a disability

common to all the senses not to perceive what is in immediate contact with the organ of sense, but our failure to apprehend what is odorous without the help of inhalation is peculiar (the fact is obvious on making the experiment). Now since bloodless animals do not breathe, they must, it might be argued, have some novel sense not reckoned among the usual five. Our reply must be that this is impossible, since it is scent that is perceived; a sense that apprehends what is odorous and what has a good or bad odour cannot be anything but smell. Further, they are observed to be deleteriously effected by the same strong odours as man is, e.g. bitumen, sulphur, and the like. These animals must be able to smell without being able to breathe. The probable explanation is that in man the organ of smell has a certain superiority over that in all other animals just as his eyes have over those of hard-eyed animals. Man's eyes have in the eyelids a kind of shelter or envelope, which must be shifted or drawn back in order that we may see, while hardeyed animals have nothing of the kind, but at once see whatever presents itself in the transparent medium. Similarly in certain species of animals the organ of smell is like the eye of hard-eyed animals, uncurtained, while in others which take in air it probably has a curtain over it, which is drawn back in inhalation, owing to the dilating of the veins or pores. That explains also why such animals cannot smell under water; to smell they must first inhale, and that they cannot do under water.

Smells come from what is dry as flavours from what is moist. Consequently the organ of smell is potentially dry.

10

What can be tasted is always something that can be touched, and just for that reason it cannot be perceived through an interposed foreign body, for touch means the absence of any intervening body. Further, the flavoured and tasteable body is suspended in a liquid matter, and this is tangible. Hence, if we lived in water, we should perceive a sweet object introduced into the water, but the water would not be the medium through which we perceived; our perception would be due to the solution of the sweet substance in what we imbibed, just as if it were mixed with some drink. There is no parallel here to the perception of colour, which is due neither to any blending of anything with anything, nor to any efflux of anything from anything. In the case of taste, there is nothing corresponding to the medium in the case of the senses previously discussed; but as the object of sight is colour, so the object of taste is flavour. But nothing excites a perception of flavour without the help of liquid; what acts upon the sense of taste must be either actually or potentially liquid like what is saline; it must be both (a) itself easily dissolved, and (b) capable of dissolving along with itself the tongue. Taste apprehends both (a) what has taste and (b) what has no taste, if we mean by (b) what has only a slight or feeble flavour or what tends to destroy the sense of taste. In this it is exactly parallel to sight, which apprehends both what is visible and what is invisible (for darkness is invisible and yet is discriminated by sight; so is, in a different way, what is over brilliant), and to hearing, which apprehends both sound and silence, of which the one is audible and the other inaudible, and also over-loud sound. This corresponds in the case of hearing to over-bright light in the case of sight. As a faint sound is 'inaudible', so in a sense is a loud or violent sound. The word 'invisible' and similar privative terms cover not only (a) what is simply without some power, but also (b) what is adapted by nature to have it but has not it or has it only in a very low

degree, as when we say that a species of swallow is 'footless' or that a variety of fruit is 'stoneless'. So too taste has as its object both what can be tasted and the tasteless – the latter in the sense of what has little flavour or a bad flavour or one destructive of taste. The difference between what is tasteless and what is not seems to rest ultimately on that between what is drinkable and what is undrinkable both are tasteable, but the latter is bad and tends to destroy taste, while the former is the normal stimulus of taste. What is drinkable is the common object of both touch and taste.

Since what can be tasted is liquid, the organ for its perception cannot be either (a) actually liquid or (b) incapable of becoming liquid. Tasting means a being affected by what can be tasted as such; hence the organ of taste must be liquefied, and so to start with must be non-liquid but capable of liquefaction without loss of its distinctive nature. This is confirmed by the fact that the tongue cannot taste either when it is too dry or when it is too moist; in the latter case what occurs is due to a contact with the pre-existent moisture in the tongue itself, when after a foretaste of some strong flavour we try to taste another flavour; it is in this way that sick persons find everything they taste bitter, viz. because, when they taste, their tongues are overflowing with bitter moisture.

The species of flavour are, as in the case of colour, (a) simple, i.e. the two contraries, the sweet and the bitter, (b) secondary, viz. (i) on the side of the sweet, the succulent, (ii) on the side of the bitter, the saline, (iii) between these come the pungent, the harsh, the astringent, and the acid; these pretty well exhaust the varieties of flavour. It follows that what has the power of tasting is what is potentially of that kind, and that what is tasteable is what has the power of making it actually what it itself already is.

11

Whatever can be said of what is tangible, can be said of touch, and vice versa; if touch is not a single sense but a group of senses, there must be several kinds of what is tangible. It is a problem whether touch is a single sense or a group of senses. It is also a problem, what is the organ of touch; is it or is it not the flesh (including what in certain animals is homologous with flesh)? On the second view, flesh is 'the medium' of touch, the real organ being situated farther inward. The problem arises because the field of each sense is according to the accepted view determined as the range between a single pair of contraries, white and black for sight, acute and grave for hearing, bitter and sweet for taste; but in the field of what is tangible we find several such pairs, hot cold, dry moist, hard soft, &c. This problem finds a partial solution, when it is recalled that in the case of the other senses more than one pair of contraries are to be met with, e.g. in sound not only acute and grave but loud and soft, smooth and rough, &c.; there are similar contrasts in the field of colour. Nevertheless we are unable clearly to detect in the case of touch what the single subject is which underlies the contrasted qualities and corresponds to sound in the case of hearing.

To the question whether the organ of touch lies inward or not (i.e. whether we need look any farther than the flesh), no indication in favour of the second answer can be drawn from the fact that if the object comes into contact with the flesh it is at once perceived. For even under present conditions if the experiment is made of making a web and stretching it tight over the flesh, as soon as this web is touched the sensation is reported in the same manner as before, yet it is clear that the or

is gan is not in this membrane. If the membrane could be grown on to the flesh, the report would travel still quicker. The flesh plays in touch very much the same part as would be played in the other senses by an air-envelope growing round our body; had we such an envelope attached to us we should have supposed that it was by a single organ that we perceived sounds, colours, and smells, and we should have taken sight, hearing, and smell to be a single sense. But as it is, because that through which the different movements are transmitted is not naturally attached to our bodies, the difference of the various sense-organs is too plain to miss. But in the case of touch the obscurity remains.

There must be such a naturally attached 'medium' as flesh, for no living body could be constructed of air or water; it must be something solid. Consequently it must be composed of earth along with these, which is just what flesh and its analogue in animals which have no true flesh tend to be. Hence of necessity the medium through which are transmitted the manifoldly contrasted tactual qualities must be a body naturally attached to the organism. That they are manifold is clear when we consider touching with the tongue; we apprehend at the tongue all tangible qualities as well as flavour. Suppose all the rest of our flesh was, like the tongue, sensitive to flavour, we should have identified the sense of taste and the sense of touch; what saves us from this identification is the fact that touch and taste are not always found together in the same part of the body. The following problem might be raised. Let us assume that every body has depth, i.e. has three dimensions, and that if two bodies have a third body between them they cannot be in contact with one another; let us remember that what is liquid is a body and must be or contain water, and that if two bodies touch one another under water, their touching surfaces cannot be dry, but must have water between, viz. the water which wets their bounding surfaces; from all this it follows that in water two

bodies cannot be in contact with one another. The same holds of two bodies in air – air being to bodies in air precisely what water is to bodies in water – but the facts are not so evident to our observation, because we live in air, just as animals that live in water would not notice that the things which touch one another in water have wet surfaces. The problem, then, is: does the perception of all objects of sense take place in the same way, or does it not, e.g. taste and touch requiring contact (as they are commonly thought to do), while all other senses perceive over a distance? The distinction is unsound; we perceive what is hard or soft, as well as the objects of hearing, sight, and smell, through a 'medium', only that the latter are perceived over a greater distance than the former; that is why the facts escape our notice. For we do perceive everything through a medium; but in these cases the fact escapes us. Yet, to repeat what we said before, if the medium for touch were a membrane separating us from the object without our observing its existence, we should be relatively to it in the same condition as we are now to air or water in which we are immersed; in their case we fancy we can touch objects, nothing coming in between us and them. But there remains this difference between what can be touched and what can be seen or can sound; in the latter two cases we perceive because the medium produces a certain effect upon us, whereas in the perception of objects of touch we are affected not by but along with the medium; it is as if a man were struck through his shield, where the shock is not first given to the shield and passed on to the man, but the concussion of both is simultaneous.

In general, flesh and the tongue are related to the real organs of touch and taste, as air and water are to those of sight, hearing, and smell. Hence in neither the one case nor the other can there be any perception of an object if it is placed immediately upon the organ, e.g. if a white object is placed on the surface of the eye. This again shows that what has the power of perceiving

the tangible is seated inside. Only so would there be a complete analogy with all the other senses. In their case if you place the object on the organ it is not perceived, here if you place it on the flesh it is perceived; therefore flesh is not the organ but the medium of touch.

What can be touched are distinctive qualities of body as body; by such differences I mean those which characterize the elements, viz, hot cold, dry moist, of which we have spoken earlier in our treatise on the elements. The organ for the perception of these is that of touch – that part of the body in which primarily the sense of touch resides. This is that part which is potentially such as its object is actually: for all sense-perception is a process of being so affected; so that that which makes something such as it itself actually is makes the other such because the other is already potentially such. That is why when an object of touch is equally hot and cold or hard and soft we cannot perceive; what we perceive must have a degree of the sensible quality lying beyond the neutral point. This implies that the sense itself is a 'mean' between any two opposite qualities which determine the field of that sense. It is to this that it owes its power of discerning the objects in that field. What is 'in the middle' is fitted to discern; relatively to either extreme it can put itself in the place of the other. As what is to perceive both white and black must, to begin with, be actually neither but potentially either (and so with all the other sense-organs), so the organ of touch must be neither hot nor cold.

Further, as in a sense sight had for its object both what was visible and what was invisible (and there was a parallel truth about all the other senses discussed), so touch has for its object both what is tangible and what is intangible. Here by 'intangible' is meant (a) what like air possesses some quality of tangible things in a very slight degree and (b) what possesses it in an excessive degree, as destructive things do.

We have now given an outline account of each of the several senses.

12

The following results applying to any and every sense may now be formulated.

(A) By a 'sense' is meant what has the power of receiving into itself the sensible forms of things without the matter. This must be conceived of as taking place in the way in which a piece of wax takes on the impress of a signet-ring without the iron or gold; we say that what produces the impression is a signet of bronze or gold, but its particular metallic constitution makes no difference: in a similar way the sense is affected by what is coloured or flavoured or sounding, but it is indifferent what in each case the substance is; what alone matters is what quality it has, i.e. in what ratio its constituents are combined.

(B) By 'an organ of sense' is meant that in which ultimately such a power is seated.

The sense and its organ are the same in fact, but their essence is not the same. What perceives is, of course, a spatial magnitude, but we must not admit that either the having the power to perceive or the sense itself is a magnitude; what they are is a certain ratio or power in a magnitude. This enables us to explain why objects of sense which possess one of two opposite sensible qualities in a degree largely in excess of the other opposite destroy the organs of sense; if the movement set up by an object is too strong for the organ, the equipoise of contrary qualities in the organ, which just is its sensory power, is disturbed; it is precisely as concord and tone are destroyed by

too violently twanging the strings of a lyre. This explains also why plants cannot perceive. in spite of their having a portion of soul in them and obviously being affected by tangible objects themselves; for undoubtedly their temperature can be lowered or raised. The explanation is that they have no mean of contrary qualities, and so no principle in them capable of taking on the forms of sensible objects without their matter; in the case of plants the affection is an affection by form-and-matter together. The problem might be raised: Can what cannot smell be said to be affected by smells or what cannot see by colours, and so on? It might be said that a smell is just what can be smelt, and if it produces any effect it can only be so as to make something smell it, and it might be argued that what cannot smell cannot be affected by smells and further that what can smell can be affected by it only in so far as it has in it the power to smell (similarly with the proper objects of all the other senses). Indeed that this is so is made quite evident as follows. Light or darkness, sounds and smells leave bodies quite unaffected; what does affect bodies is not these but the bodies which are their vehicles, e.g. what splits the trunk of a tree is not the sound of the thunder but the air which accompanies thunder. Yes, but, it may be objected, bodies are affected by what is tangible and by flavours. If not, by what are things that are without soul affected, i.e. altered in quality? Must we not, then, admit that the objects of the other senses also may affect them? Is not the true account this, that all bodies are capable of being affected by smells and sounds, but that some on being acted upon, having no boundaries of their own, disintegrate, as in the instance of air, which does become odorous, showing that some effect is produced on it by what is odorous? But smelling is more than such an affection by what is odorous – what more? Is not the answer that, while the air owing to the momentary duration of the action upon it of what is odorous does itself

become perceptible to the sense of smell, smelling is an observing of the result produced?

Book III

1

That there is no sixth sense in addition to the five enumerated – sight, hearing, smell, taste, touch – may be established by the following considerations:

If we have actually sensation of everything of which touch can give us sensation (for all the qualities of the tangible qua tangible are perceived by us through touch); and if absence of a sense necessarily involves absence of a sense-organ; and if (1) all objects that we perceive by immediate contact with them are perceptible by touch, which sense we actually possess, and (2) all objects that we perceive through media, i.e. without immediate contact, are perceptible by or through the simple elements, e.g. air and water (and this is so arranged that (a) if more than one kind of sensible object is perceivable through a single medium, the possessor of a sense-organ homogeneous with that medium has the power of perceiving both kinds of objects; for example, if the sense-organ is made of air, and air is a medium both for sound and for colour; and that (b) if more than one medium can transmit the same kind of sensible objects, as e.g. water as well as air can transmit colour, both being transparent, then the possessor of either alone will be

able to perceive the kind of objects transmissible through both); and if of the simple elements two only, air and water, go to form sense-organs (for the pupil is made of water, the organ of hearing is made of air, and the organ of smell of one or other of these two, while fire is found either in none or in all – warmth being an essential condition of all sensibility – and earth either in none or, if anywhere, specially mingled with the components of the organ of touch; wherefore it would remain that there can be no sense-organ formed of anything except water and air); and if these sense-organs are actually found in certain animals; – then all the possible senses are possessed by those animals that are not imperfect or mutilated (for even the mole is observed to have eyes beneath its skin); so that, if there is no fifth element and no property other than those which belong to the four elements of our world, no sense can be wanting to such animals.

Further, there cannot be a special sense-organ for the common sensibles either, i.e. the objects which we perceive incidentally through this or that special sense, e.g. movement, rest, figure, magnitude, number, unity; for all these we perceive by movement, e.g. magnitude by movement, and therefore also figure (for figure is a species of magnitude), what is at rest by the absence of movement: number is perceived by the negation of continuity, and by the special sensibles; for each sense perceives one class of sensible objects. So that it is clearly impossible that there should be a special sense for any one of the common sensibles, e.g. movement; for, if that were so, our perception of it would be exactly parallel to our present perception of what is sweet by vision. That is so because we have a sense for each of the two qualities, in virtue of which when they happen to meet in one sensible object we are aware of both contemporaneously. If it were not like this our perception of the common qualities would always be incidental, i.e. as is the perception of Cleon's son, where we perceive him

not as Cleon's son but as white, and the white thing which we really perceive happens to be Cleon's son.

But in the case of the common sensibles there is already in us a general sensibility which enables us to perceive them directly; there is therefore no special sense required for their perception: if there were, our perception of them would have been exactly like what has been above described.

The senses perceive each other's special objects incidentally; not because the percipient sense is this or that special sense, but because all form a unity: this incidental perception takes place whenever sense is directed at one and the same moment to two disparate qualities in one and the same object, e.g. to the bitterness and the yellowness of bile, the assertion of the identity of both cannot be the act of either of the senses; hence the illusion of sense, e.g. the belief that if a thing is yellow it is bile.

It might be asked why we have more senses than one. Is it to prevent a failure to apprehend the common sensibles, e.g. movement, magnitude, and number, which go along with the special sensibles? Had we no sense but sight, and that sense no object but white, they would have tended to escape our notice and everything would have merged for us into an indistinguishable identity because of the concomitance of colour and magnitude. As it is, the fact that the common sensibles are given in the objects of more than one sense reveals their distinction from each and all of the special sensibles.

2

Since it is through sense that we are aware that we are seeing or hearing, it must be either by sight that we are aware of seeing, or by some sense other than sight. But the sense that gives us this new sensation must perceive both sight and its object, viz. colour: so that either (1) there will be two senses both percipient of the same sensible object, or (2) the sense must be percipient of itself. Further, even if the sense which perceives sight were different from sight, we must either fall into an infinite regress, or we must somewhere assume a sense which is aware of itself. If so, we ought to do this in the first case.

This presents a difficulty: if to perceive by sight is just to see, and what is seen is colour (or the coloured), then if we are to see that which sees, that which sees originally must be coloured. It is clear therefore that 'to perceive by sight' has more than one meaning; for even when we are not seeing, it is by sight that we discriminate darkness from light, though not in the same way as we distinguish one colour from another. Further, in a sense even that which sees is coloured; for in each case the sense-organ is capable of receiving the sensible object without its matter. That is why even when the sensible objects are gone the sensings and imaginings continue to exist in the sense-organs.

The activity of the sensible object and that of the percipient sense is one and the same activity, and yet the distinction between their being remains. Take as illustration actual sound and actual hearing: a man may have hearing and yet not be hearing, and that which has a sound is not always sounding. But when that which can hear is actively hearing and which can sound is sounding, then the actual hearing and the actual sound are merged in one (these one might call respectively hearkening and sounding).

If it is true that the movement, both the acting and the being acted upon, is to be found in that which is acted upon, both the sound and the hearing so far as it is actual must be found in that which has the faculty of hearing; for it is in the passive factor that the actuality of the active or motive factor is realized; that is why that which causes movement may be at rest. Now the actuality of that which can sound is just sound or sounding, and the actuality of that which can hear is hearing or hearkening; 'sound' and 'hearing' are both ambiguous. The same account applies to the other senses and their objects. For as the-acting-and-being-acted-upon is to be found in the passive, not in the active factor, so also the actuality of the sensible object and that of the sensitive subject are both realized in the latter. But while in some cases each aspect of the total actuality has a distinct name, e.g. sounding and hearkening, in some one or other is nameless, e.g. the actuality of sight is called seeing, but the actuality of colour has no name: the actuality of the faculty of taste is called tasting, but the actuality of flavour has no name. Since the actualities of the sensible object and of the sensitive faculty are one actuality in spite of the difference between their modes of being, actual hearing and actual sounding appear and disappear from existence at one and the same moment, and so actual savour and actual tasting, &c., while as potentialities one of them may exist without the other. The earlier students of nature were mistaken in their view that without sight there was no white or black, without taste no savour. This statement of theirs is partly true, partly false: 'sense' and 'the sensible object' are ambiguous terms, i.e. may denote either potentialities or actualities: the statement is true of the latter, false of the former. This ambiguity they wholly failed to notice.

If voice always implies a concord, and if the voice and the hearing of it are in one sense one and the same, and if concord always implies a ratio, hearing as well as what is heard must be

a ratio. That is why the excess of either the sharp or the flat destroys the hearing. (So also in the case of savours excess destroys the sense of taste, and in the case of colours excessive brightness or darkness destroys the sight, and in the case of smell excess of strength whether in the direction of sweetness or bitterness is destructive.) This shows that the sense is a ratio.

That is also why the objects of sense are (1) pleasant when the sensible extremes such as acid or sweet or salt being pure and unmixed are brought into the proper ratio; then they are pleasant: and in general what is blended is more pleasant than the sharp or the flat alone; or, to touch, that which is capable of being either warmed or chilled: the sense and the ratio are identical: while (2) in excess the sensible extremes are painful or destructive.

Each sense then is relative to its particular group of sensible qualities: it is found in a sense-organ as such and discriminates the differences which exist within that group; e.g. sight discriminates white and black, taste sweet and bitter, and so in all cases. Since we also discriminate white from sweet, and indeed each sensible quality from every other, with what do we perceive that they are different? It must be by sense; for what is before us is sensible objects. (Hence it is also obvious that the flesh cannot be the ultimate sense-organ: if it were, the discriminating power could not do its work without immediate contact with the object.)

Therefore (1) discrimination between white and sweet cannot be effected by two agencies which remain separate; both the qualities discriminated must be present to something that is one and single. On any other supposition even if I perceived sweet and you perceived white, the difference between them would be apparent. What says that two things are different must be one; for sweet is different from white. Therefore what

asserts this difference must be self-identical, and as what asserts, so also what thinks or perceives. That it is not possible by means of two agencies which remain separate to discriminate two objects which are separate, is therefore obvious; and that (it is not possible to do this in separate movements of time may be seen' if we look at it as follows. For as what asserts the difference between the good and the bad is one and the same, so also the time at which it asserts the one to be different and the other to be different is not accidental to the assertion (as it is for instance when I now assert a difference but do not assert that there is now a difference); it asserts thus – both now and that the objects are different now; the objects therefore must be present at one and the same moment. Both the discriminating power and the time of its exercise must be one and undivided.

But, it may be objected, it is impossible that what is self-identical should be moved at me and the same time with contrary movements in so far as it is undivided, and in an undivided moment of time. For if what is sweet be the quality perceived, it moves the sense or thought in this determinate way, while what is bitter moves it in a contrary way, and what is white in a different way. Is it the case then that what discriminates, though both numerically one and indivisible, is at the same time divided in its being? In one sense, it is what is divided that perceives two separate objects at once, but in another sense it does so qua undivided; for it is divisible in its being but spatially and numerically undivided. is not this impossible? For while it is true that what is self-identical and undivided may be both contraries at once potentially, it cannot be self-identical in its being – it must lose its unity by being put into activity. It is not possible to be at once white and black, and therefore it must also be impossible for a thing to be affected at one and the same moment by the forms of both, assuming it to

be the case that sensation and thinking are properly so described.

The answer is that just as what is called a ‘point’ is, as being at once one and two, properly said to be divisible, so here, that which discriminates is qua undivided one, and active in a single moment of time, while so far forth as it is divisible it twice over uses the same dot at one and the same time. So far forth then as it takes the limit as two’ it discriminates two separate objects with what in a sense is divided: while so far as it takes it as one, it does so with what is one and occupies in its activity a single moment of time.

About the principle in virtue of which we say that animals are percipient, let this discussion suffice.

3

There are two distinctive peculiarities by reference to which we characterize the soul (1) local movement and (2) thinking, discriminating, and perceiving. Thinking both speculative and practical is regarded as akin to a form of perceiving; for in the one as well as the other the soul discriminates and is cognizant of something which is. Indeed the ancients go so far as to identify thinking and perceiving; e.g. Empedocles says ‘For ‘tis in respect of what is present that man’s wit is increased’, and again ‘Whence it befalls them from time to time to think diverse thoughts’, and Homer’s phrase ‘For suchlike is man’s mind’ means the same. They all look upon thinking as a bodily process like perceiving, and hold that like is known as well as perceived by like, as I explained at the beginning of our discussion. Yet they ought at the same time to have accounted for error also; for it is more intimately connected with animal

existence and the soul continues longer in the state of error than in that of truth. They cannot escape the dilemma: either (1) whatever seems is true (and there are some who accept this) or (2) error is contact with the unlike; for that is the opposite of the knowing of like by like.

But it is a received principle that error as well as knowledge in respect to contraries is one and the same.

That perceiving and practical thinking are not identical is therefore obvious; for the former is universal in the animal world, the latter is found in only a small division of it. Further, speculative thinking is also distinct from perceiving – I mean that in which we find rightness and wrongness – rightness in prudence, knowledge, true opinion, wrongness in their opposites; for perception of the special objects of sense is always free from error, and is found in all animals, while it is possible to think falsely as well as truly, and thought is found only where there is discourse of reason as well as sensibility. For imagination is different from either perceiving or discursive thinking, though it is not found without sensation, or judgement without it. That this activity is not the same kind of thinking as judgement is obvious. For imagining lies within our own power whenever we wish (e.g. we can call up a picture, as in the practice of mnemonics by the use of mental images), but in forming opinions we are not free: we cannot escape the alternative of falsehood or truth. Further, when we think something to be fearful or threatening, emotion is immediately produced, and so too with what is encouraging; but when we merely imagine we remain as unaffected as persons who are looking at a painting of some dreadful or encouraging scene. Again within the field of judgement itself we find varieties, knowledge, opinion, prudence, and their opposites; of the differences between these I must speak elsewhere.

Thinking is different from perceiving and is held to be in part imagination, in part judgement: we must therefore first mark off the sphere of imagination and then speak of judgement. If then imagination is that in virtue of which an image arises for us, excluding metaphorical uses of the term, is it a single faculty or disposition relative to images, in virtue of which we discriminate and are either in error or not? The faculties in virtue of which we do this are sense, opinion, science, intelligence.

That imagination is not sense is clear from the following considerations: Sense is either a faculty or an activity, e.g. sight or seeing: imagination takes place in the absence of both, as e.g. in dreams. (Again, sense is always present, imagination not. If actual imagination and actual sensation were the same, imagination would be found in all the brutes: this is held not to be the case; e.g. it is not found in ants or bees or grubs. (Again, sensations are always true, imaginations are for the most part false. (Once more, even in ordinary speech, we do not, when sense functions precisely with regard to its object, say that we imagine it to be a man, but rather when there is some failure of accuracy in its exercise. And as we were saying before, visions appear to us even when our eyes are shut. Neither is imagination any of the things that are never in error: e.g. knowledge or intelligence; for imagination may be false.

It remains therefore to see if it is opinion, for opinion may be either true or false.

But opinion involves belief (for without belief in what we opine we cannot have an opinion), and in the brutes though we often find imagination we never find belief. Further, every opinion is accompanied by belief, belief by conviction, and conviction by discourse of reason: while there are some of the brutes in which we find imagination, without discourse of reason. It is clear

then that imagination cannot, again, be (1) opinion plus sensation, or (2) opinion mediated by sensation, or (3) a blend of opinion and sensation; this is impossible both for these reasons and because the content of the supposed opinion cannot be different from that of the sensation (I mean that imagination must be the blending of the perception of white with the opinion that it is white: it could scarcely be a blend of the opinion that it is good with the perception that it is white): to imagine is therefore (on this view) identical with the thinking of exactly the same as what one in the strictest sense perceives. But what we imagine is sometimes false though our contemporaneous judgement about it is true; e.g. we imagine the sun to be a foot in diameter though we are convinced that it is larger than the inhabited part of the earth, and the following dilemma presents itself. Either (a while the fact has not changed and the (observer has neither forgotten nor lost belief in the true opinion which he had, that opinion has disappeared, or (b) if he retains it then his opinion is at once true and false. A true opinion, however, becomes false only when the fact alters without being noticed.

Imagination is therefore neither any one of the states enumerated, nor compounded out of them.

But since when one thing has been set in motion another thing may be moved by it, and imagination is held to be a movement and to be impossible without sensation, i.e. to occur in beings that are percipient and to have for its content what can be perceived, and since movement may be produced by actual sensation and that movement is necessarily similar in character to the sensation itself, this movement must be (1) necessarily (a) incapable of existing apart from sensation, (b) incapable of existing except when we perceive, (such that in virtue of its possession that in which it is found may present various

phenomena both active and passive, and (such that it may be either true or false.

The reason of the last characteristic is as follows. Perception (1) of the special objects of sense is never in error or admits the least possible amount of falsehood. (2) That of the concomitance of the objects concomitant with the sensible qualities comes next: in this case certainly we may be deceived; for while the perception that there is white before us cannot be false, the perception that what is white is this or that may be false. (3) Third comes the perception of the universal attributes which accompany the concomitant objects to which the special sensibles attach (I mean e.g. of movement and magnitude); it is in respect of these that the greatest amount of sense-illusion is possible.

The motion which is due to the activity of sense in these three modes of its exercise will differ from the activity of sense; (1) the first kind of derived motion is free from error while the sensation is present; (2) and (3) the others may be erroneous whether it is present or absent, especially when the object of perception is far off. If then imagination presents no other features than those enumerated and is what we have described, then imagination must be a movement resulting from an actual exercise of a power of sense.

As sight is the most highly developed sense, the name Phantasia (imagination) has been formed from Phaos (light) because it is not possible to see without light.

And because imaginations remain in the organs of sense and resemble sensations, animals in their actions are largely guided by them, some (i.e. the brutes) because of the non-existence in them of mind, others (i.e. men) because of the temporary eclipse in them of mind by feeling or disease or sleep.

About imagination, what it is and why it exists, let so much suffice.

4

Turning now to the part of the soul with which the soul knows and thinks (whether this is separable from the others in definition only, or spatially as well) we have to inquire (1) what differentiates this part, and (2) how thinking can take place.

If thinking is like perceiving, it must be either a process in which the soul is acted upon by what is capable of being thought, or a process different from but analogous to that. The thinking part of the soul must therefore be, while impassible, capable of receiving the form of an object; that is, must be potentially identical in character with its object without being the object. Mind must be related to what is thinkable, as sense is to what is sensible.

Therefore, since everything is a possible object of thought, mind in order, as Anaxagoras says, to dominate, that is, to know, must be pure from all admixture; for the co-presence of what is alien to its nature is a hindrance and a block: it follows that it too, like the sensitive part, can have no nature of its own, other than that of having a certain capacity. Thus that in the soul which is called mind (by mind I mean that whereby the soul thinks and judges) is, before it thinks, not actually any real thing. For this reason it cannot reasonably be regarded as blended with the body: if so, it would acquire some quality, e.g. warmth or cold, or even have an organ like the sensitive faculty: as it is, it has none. It was a good idea to call the soul 'the place of forms', though (1) this description holds only of the intellective soul, and (2) even this is the forms only potentially, not actually.

Observation of the sense-organs and their employment reveals a distinction between the impassibility of the sensitive and that of the intellective faculty. After strong stimulation of a sense we are less able to exercise it than before, as e.g. in the case of a loud sound we cannot hear easily immediately after, or in the case of a bright colour or a powerful odour we cannot see or smell, but in the case of mind thought about an object that is highly intelligible renders it more and not less able afterwards to think objects that are less intelligible: the reason is that while the faculty of sensation is dependent upon the body, mind is separable from it.

Once the mind has become each set of its possible objects, as a man of science has, when this phrase is used of one who is actually a man of science (this happens when he is now able to exercise the power on his own initiative), its condition is still one of potentiality, but in a different sense from the potentiality which preceded the acquisition of knowledge by learning or discovery: the mind too is then able to think itself.

Since we can distinguish between a spatial magnitude and what it is to be such, and between water and what it is to be water, and so in many other cases (though not in all; for in certain cases the thing and its form are identical), flesh and what it is to be flesh are discriminated either by different faculties, or by the same faculty in two different states: for flesh necessarily involves matter and is like what is snub-nosed, a this in a this. Now it is by means of the sensitive faculty that we discriminate the hot and the cold, i.e. the factors which combined in a certain ratio constitute flesh: the essential character of flesh is apprehended by something different either wholly separate from the sensitive faculty or related to it as a bent line to the same line when it has been straightened out.

Again in the case of abstract objects what is straight is analogous to what is snub-nosed; for it necessarily implies a continuum as its matter: its constitutive essence is different, if we may distinguish between straightness and what is straight: let us take it to be two-ness. It must be apprehended, therefore, by a different power or by the same power in a different state. To sum up, in so far as the realities it knows are capable of being separated from their matter, so it is also with the powers of mind.

The problem might be suggested: if thinking is a passive affection, then if mind is simple and impassible and has nothing in common with anything else, as Anaxagoras says, how can it come to think at all? For interaction between two factors is held to require a precedent community of nature between the factors. Again it might be asked, is mind a possible object of thought to itself? For if mind is thinkable per se and what is thinkable is in kind one and the same, then either (a) mind will belong to everything, or (b) mind will contain some element common to it with all other realities which makes them all thinkable.

(1) Have not we already disposed of the difficulty about interaction involving a common element, when we said that mind is in a sense potentially whatever is thinkable, though actually it is nothing until it has thought? What it thinks must be in it just as characters may be said to be on a writingtablet on which as yet nothing actually stands written: this is exactly what happens with mind.

(Mind is itself thinkable in exactly the same way as its objects are. For (a) in the case of objects which involve no matter, what thinks and what is thought are identical; for speculative knowledge and its object are identical. (Why mind is not always thinking we must consider later.) (b) In the case of those which

contain matter each of the objects of thought is only potentially present. It follows that while they will not have mind in them (for mind is a potentiality of them only in so far as they are capable of being disengaged from matter) mind may yet be thinkable.

5

Since in every class of things, as in nature as a whole, we find two factors involved, (1) a matter which is potentially all the particulars included in the class, (2) a cause which is productive in the sense that it makes them all (the latter standing to the former, as e.g. an art to its material), these distinct elements must likewise be found within the soul.

And in fact mind as we have described it is what it is what it is by virtue of becoming all things, while there is another which is what it is by virtue of making all things: this is a sort of positive state like light; for in a sense light makes potential colours into actual colours.

Mind in this sense of it is separable, impassible, unmixed, since it is in its essential nature activity (for always the active is superior to the passive factor, the originating force to the matter which it forms).

Actual knowledge is identical with its object: in the individual, potential knowledge is in time prior to actual knowledge, but in the universe as a whole it is not prior even in time. Mind is not at one time knowing and at another not. When mind is set free from its present conditions it appears as just what it is and nothing more: this alone is immortal and eternal (we do not, however, remember its former activity because, while mind in

this sense is impassible, mind as passive is destructible), and without it nothing thinks.

6

The thinking then of the simple objects of thought is found in those cases where falsehood is impossible: where the alternative of true or false applies, there we always find a putting together of objects of thought in a quasi-unity. As Empedocles said that 'where heads of many a creature sprouted without necks' they afterwards by Love's power were combined, so here too objects of thought which were given separate are combined, e.g. 'incommensurate' and 'diagonal': if the combination be of objects past or future the combination of thought includes in its content the date. For falsehood always involves a synthesis; for even if you assert that what is white is not white you have included not white in a synthesis. It is possible also to call all these cases division as well as combination. However that may be, there is not only the true or false assertion that Cleon is white but also the true or false assertion that he was or will he white. In each and every case that which unifies is mind.

Since the word 'simple' has two senses, i.e. may mean either (a) 'not capable of being divided' or (b) 'not actually divided', there is nothing to prevent mind from knowing what is undivided, e.g. when it apprehends a length (which is actually undivided) and that in an undivided time; for the time is divided or undivided in the same manner as the line. It is not possible, then, to tell what part of the line it was apprehending in each half of the time: the object has no actual parts until it has been divided: if in thought you think each half separately, then by the same act

you divide the time also, the half-lines becoming as it were new wholes of length. But if you think it as a whole consisting of these two possible parts, then also you think it in a time which corresponds to both parts together. (But what is not quantitatively but qualitatively simple is thought in a simple time and by a simple act of the soul.)

But that which mind thinks and the time in which it thinks are in this case divisible only incidentally and not as such. For in them too there is something indivisible (though, it may be, not isolable) which gives unity to the time and the whole of length; and this is found equally in every continuum whether temporal or spatial.

Points and similar instances of things that divide, themselves being indivisible, are realized in consciousness in the same manner as privations.

A similar account may be given of all other cases, e.g. how evil or black is cognized; they are cognized, in a sense, by means of their contraries. That which cognizes must have an element of potentiality in its being, and one of the contraries must be in it. But if there is anything that has no contrary, then it knows itself and is actually and possesses independent existence.

Assertion is the saying of something concerning something, e.g. affirmation, and is in every case either true or false: this is not always the case with mind: the thinking of the definition in the sense of the constitutive essence is never in error nor is it the assertion of something concerning something, but, just as while the seeing of the special object of sight can never be in error, the belief that the white object seen is a man may be mistaken, so too in the case of objects which are without matter.

7

Actual knowledge is identical with its object: potential knowledge in the individual is in time prior to actual knowledge but in the universe it has no priority even in time; for all things that come into being arise from what actually is. In the case of sense clearly the sensitive faculty already was potentially what the object makes it to be actually; the faculty is not affected or altered. This must therefore be a different kind from movement; for movement is, as we saw, an activity of what is imperfect, activity in the unqualified sense, i.e. that of what has been perfected, is different from movement.

To perceive then is like bare asserting or knowing; but when the object is pleasant or painful, the soul makes a quasi-affirmation or negation, and pursues or avoids the object. To feel pleasure or pain is to act with the sensitive mean towards what is good or bad as such. Both avoidance and appetite when actual are identical with this: the faculty of appetite and avoidance are not different, either from one another or from the faculty of sense-perception; but their being is different.

To the thinking soul images serve as if they were contents of perception (and when it asserts or denies them to be good or bad it avoids or pursues them). That is why the soul never thinks without an image. The process is like that in which the air modifies the pupil in this or that way and the pupil transmits the modification to some third thing (and similarly in hearing), while the ultimate point of arrival is one, a single mean, with different manners of being.

With what part of itself the soul discriminates sweet from hot I have explained before and must now describe again as follows: That with which it does so is a sort of unity, but in the way just mentioned, i.e. as a connecting term. And the two faculties it connects, being one by analogy and numerically, are each to

each as the qualities discerned are to one another (for what difference does it make whether we raise the problem of discrimination between disparates or between contraries, e.g. white and black?). Let then C be to D as is to B: it follows alternando that C: A:: D: B. If then C and D belong to one subject, the case will be the same with them as with and B; and B form a single identity with different modes of being; so too will the former pair. The same reasoning holds if be sweet and B white.

The faculty of thinking then thinks the forms in the images, and as in the former case what is to be pursued or avoided is marked out for it, so where there is no sensation and it is engaged upon the images it is moved to pursuit or avoidance. E.g.. perceiving by sense that the beacon is fire, it recognizes in virtue of the general faculty of sense that it signifies an enemy, because it sees it moving; but sometimes by means of the images or thoughts which are within the soul, just as if it were seeing, it calculates and deliberates what is to come by reference to what is present; and when it makes a pronouncement, as in the case of sensation it pronounces the object to be pleasant or painful, in this case it avoids or persues and so generally in cases of action.

That too which involves no action, i.e. that which is true or false, is in the same province with what is good or bad: yet they differ in this, that the one set imply and the other do not a reference to a particular person.

The so-called abstract objects the mind thinks just as, if one had thought of the snubnosed not as snub-nosed but as hollow, one would have thought of an actuality without the flesh in which it is embodied: it is thus that the mind when it is thinking the objects of Mathematics thinks as separate elements which do not exist separate. In every case the mind which is actively thinking is the objects which it thinks.

Whether it is possible for it while not existing separate from spatial conditions to think anything that is separate, or not, we must consider later.

8

Let us now summarize our results about soul, and repeat that the soul is in a way all existing things; for existing things are either sensible or thinkable, and knowledge is in a way what is knowable, and sensation is in a way what is sensible: in what way we must inquire.

Knowledge and sensation are divided to correspond with the realities, potential knowledge and sensation answering to potentialities, actual knowledge and sensation to actualities. Within the soul the faculties of knowledge and sensation are potentially these objects, the one what is knowable, the other what is sensible. They must be either the things themselves or their forms. The former alternative is of course impossible: it is not the stone which is present in the soul but its form.

It follows that the soul is analogous to the hand; for as the hand is a tool of tools, so the mind is the form of forms and sense the form of sensible things.

Since according to common agreement there is nothing outside and separate in existence from sensible spatial magnitudes, the objects of thought are in the sensible forms, viz. both the abstract objects and all the states and affections of sensible things. Hence (1) no one can learn or understand anything in the absence of sense, and (when the mind is actively aware of anything it is necessarily aware of it along with an image; for

images are like sensuous contents except in that they contain no matter.

Imagination is different from assertion and denial; for what is true or false involves a synthesis of concepts. In what will the primary concepts differ from images? Must we not say that neither these nor even our other concepts are images, though they necessarily involve them?

9

The soul of animals is characterized by two faculties, (a) the faculty of discrimination which is the work of thought and sense, and (b) the faculty of originating local movement. Sense and mind we have now sufficiently examined. Let us next consider what it is in the soul which originates movement. Is it a single part of the soul separate either spatially or in definition? Or is it the soul as a whole? If it is a part, is that part different from those usually distinguished or already mentioned by us, or is it one of them? The problem at once presents itself, in what sense we are to speak of parts of the soul, or how many we should distinguish. For in a sense there is an infinity of parts: it is not enough to distinguish, with some thinkers, the calculative, the passionate, and the desiderative, or with others the rational and the irrational; for if we take the dividing lines followed by these thinkers we shall find parts far more distinctly separated from one another than these, namely those we have just mentioned: (1) the nutritive, which belongs both to plants and to all animals, and (2) the sensitive, which cannot easily be classed as either irrational or rational; further (3) the imaginative, which is, in its being, different from all, while it is very hard to say with which of the others it is the same or not

the same, supposing we determine to posit separate parts in the soul; and lastly (4) the appetitive, which would seem to be distinct both in definition and in power from all hitherto enumerated.

It is absurd to break up the last-mentioned faculty: as these thinkers do, for wish is found in the calculative part and desire and passion in the irrational; and if the soul is tripartite appetite will be found in all three parts. Turning our attention to the present object of discussion, let us ask what that is which originates local movement of the animal.

The movement of growth and decay, being found in all living things, must be attributed to the faculty of reproduction and nutrition, which is common to all: inspiration and expiration, sleep and waking, we must consider later: these too present much difficulty: at present we must consider local movement, asking what it is that originates forward movement in the animal.

That it is not the nutritive faculty is obvious; for this kind of movement is always for an end and is accompanied either by imagination or by appetite; for no animal moves except by compulsion unless it has an impulse towards or away from an object. Further, if it were the nutritive faculty, even plants would have been capable of originating such movement and would have possessed the organs necessary to carry it out. Similarly it cannot be the sensitive faculty either; for there are many animals which have sensibility but remain fast and immovable throughout their lives.

If then Nature never makes anything without a purpose and never leaves out what is necessary (except in the case of mutilated or imperfect growths; and that here we have neither mutilation nor imperfection may be argued from the facts that such animals (a) can reproduce their species and (b) rise to

completeness of nature and decay to an end), it follows that, had they been capable of originating forward movement, they would have possessed the organs necessary for that purpose. Further, neither can the calculative faculty or what is called 'mind' be the cause of such movement; for mind as speculative never thinks what is practicable, it never says anything about an object to be avoided or pursued, while this movement is always in something which is avoiding or pursuing an object. No, not even when it is aware of such an object does it at once enjoin pursuit or avoidance of it; e.g. the mind often thinks of something terrifying or pleasant without enjoining the emotion of fear. It is the heart that is moved (or in the case of a pleasant object some other part). Further, even when the mind does command and thought bids us pursue or avoid something, sometimes no movement is produced; we act in accordance with desire, as in the case of moral weakness. And, generally, we observe that the possessor of medical knowledge is not necessarily healing, which shows that something else is required to produce action in accordance with knowledge; the knowledge alone is not the cause. Lastly, appetite too is incompetent to account fully for movement; for those who successfully resist temptation have appetite and desire and yet follow mind and refuse to enact that for which they have appetite.

10

These two at all events appear to be sources of movement: appetite and mind (if one may venture to regard imagination as a kind of thinking; for many men follow their imaginations contrary to knowledge, and in all animals other than man there is no thinking or calculation but only imagination).

Both of these then are capable of originating local movement, mind and appetite: (1) mind, that is, which calculates means to an end, i.e. mind practical (it differs from mind speculative in the character of its end); while (2) appetite is in every form of it relative to an end: for that which is the object of appetite is the stimulant of mind practical; and that which is last in the process of thinking is the beginning of the action. It follows that there is a justification for regarding these two as the sources of movement, i.e. appetite and practical thought; for the object of appetite starts a movement and as a result of that thought gives rise to movement, the object of appetite being it a source of stimulation. So too when imagination originates movement, it necessarily involves appetite.

That which moves therefore is a single faculty and the faculty of appetite; for if there had been two sources of movement – mind and appetite – they would have produced movement in virtue of some common character. As it is, mind is never found producing movement without appetite (for wish is a form of appetite; and when movement is produced according to calculation it is also according to wish), but appetite can originate movement contrary to calculation, for desire is a form of appetite. Now mind is always right, but appetite and imagination may be either right or wrong. That is why, though in any case it is the object of appetite which originates movement, this object may be either the real or the apparent good. To produce movement the object must be more than this: it must be good that can be brought into being by action; and only what can be otherwise than as it is can thus be brought into being. That then such a power in the soul as has been described, i.e. that called appetite, originates movement is clear. Those who distinguish parts in the soul, if they distinguish and divide in accordance with differences of power, find themselves with a very large number of parts, a nutritive, a sensitive, an intellective, a deliberative, and now an appetitive part; for these

are more different from one another than the faculties of desire and passion.

Since appetites run counter to one another, which happens when a principle of reason and a desire are contrary and is possible only in beings with a sense of time (for while mind bids us hold back because of what is future, desire is influenced by what is just at hand: a pleasant object which is just at hand presents itself as both pleasant and good, without condition in either case, because of want of foresight into what is farther away in time), it follows that while that which originates movement must be specifically one, viz. the faculty of appetite as such (or rather farthest back of all the object of that faculty; for it is it that itself remaining unmoved originates the movement by being apprehended in thought or imagination), the things that originate movement are numerically many.

All movement involves three factors, (1) that which originates the movement, (2) that by means of which it originates it, and (3) that which is moved. The expression 'that which originates the movement' is ambiguous: it may mean either (a) something which itself is unmoved or (b) that which at once moves and is moved. Here that which moves without itself being moved is the realizable good, that which at once moves and is moved is the faculty of appetite (for that which is influenced by appetite so far as it is actually so influenced is set in movement, and appetite in the sense of actual appetite is a kind of movement), while that which is in motion is the animal. The instrument which appetite employs to produce movement is no longer psychical but bodily: hence the examination of it falls within the province of the functions common to body and soul. To state the matter summarily at present, that which is the instrument in the production of movement is to be found where a beginning and an end coincide as e.g. in a ball and socket joint; for there the convex and the concave sides are respectively an

end and a beginning (that is why while the one remains at rest, the other is moved): they are separate in definition but not separable spatially. For everything is moved by pushing and pulling. Hence just as in the case of a wheel, so here there must be a point which remains at rest, and from that point the movement must originate.

To sum up, then, and repeat what I have said, inasmuch as an animal is capable of appetite it is capable of self-movement; it is not capable of appetite without possessing imagination; and all imagination is either (1) calculative or (2) sensitive. In the latter an animals, and not only man, partake.

11

We must consider also in the case of imperfect animals, sc. those which have no sense but touch, what it is that in them originates movement. Can they have imagination or not? or desire? Clearly they have feelings of pleasure and pain, and if they have these they must have desire. But how can they have imagination? Must not we say that, as their movements are indefinite, they have imagination and desire, but indefinitely?

Sensitive imagination, as we have said, is found in all animals, deliberative imagination only in those that are calculative: for whether this or that shall be enacted is already a task requiring calculation; and there must be a single standard to measure by, for that is pursued which is greater. It follows that what acts in this way must be able to make a unity out of several images.

This is the reason why imagination is held not to involve opinion, in that it does not involve opinion based on inference, though opinion involves imagination. Hence appetite contains

no deliberative element. Sometimes it overpowers wish and sets it in movement: at times wish acts thus upon appetite, like one sphere imparting its movement to another, or appetite acts thus upon appetite, i.e. in the condition of moral weakness (though by nature the higher faculty is always more authoritative and gives rise to movement). Thus three modes of movement are possible.

The faculty of knowing is never moved but remains at rest. Since the one premiss or judgement is universal and the other deals with the particular (for the first tells us that such and such a kind of man should do such and such a kind of act, and the second that this is an act of the kind meant, and I a person of the type intended), it is the latter opinion that really originates movement, not the universal; or rather it is both, but the one does so while it remains in a state more like rest, while the other partakes in movement.

12

The nutritive soul then must be possessed by everything that is alive, and every such thing is endowed with soul from its birth to its death. For what has been born must grow, reach maturity, and decay – all of which are impossible without nutrition. Therefore the nutritive faculty must be found in everything that grows and decays.

But sensation need not be found in all things that live. For it is impossible for touch to belong either (1) to those whose body is uncompounded or (2) to those which are incapable of taking in the forms without their matter.

But animals must be endowed with sensation, since Nature does nothing in vain. For all things that exist by Nature are means to an end, or will be concomitants of means to an end. Every body capable of forward movement would, if unendowed with sensation, perish and fail to reach its end, which is the aim of Nature; for how could it obtain nutriment? Stationary living things, it is true, have as their nutriment that from which they have arisen; but it is not possible that a body which is not stationary but produced by generation should have a soul and a discerning mind without also having sensation. (Nor yet even if it were not produced by generation. Why should it not have sensation? Because it were better so either for the body or for the soul? But clearly it would not be better for either: the absence of sensation will not enable the one to think better or the other to exist better.) Therefore no body which is not stationary has soul without sensation.

But if a body has sensation, it must be either simple or compound. And simple it cannot be; for then it could not have touch, which is indispensable. This is clear from what follows. An animal is a body with soul in it: every body is tangible, i.e. perceptible by touch; hence necessarily, if an animal is to survive, its body must have tactual sensation. All the other senses, e.g. smell, sight, hearing, apprehend through media; but where there is immediate contact the animal, if it has no sensation, will be unable to avoid some things and take others, and so will find it impossible to survive. That is why taste also is a sort of touch; it is relative to nutriment, which is just tangible body; whereas sound, colour, and odour are innutritious, and further neither grow nor decay. Hence it is that taste also must be a sort of touch, because it is the sense for what is tangible and nutritious.

Both these senses, then, are indispensable to the animal, and it is clear that without touch it is impossible for an animal to be.

All the other senses subserve well-being and for that very reason belong not to any and every kind of animal, but only to some, e.g. those capable of forward movement must have them; for, if they are to survive, they must perceive not only by immediate contact but also at a distance from the object. This will be possible if they can perceive through a medium, the medium being affected and moved by the perceptible object, and the animal by the medium. just as that which produces local movement causes a change extending to a certain point, and that which gave an impulse causes another to produce a new impulse so that the movement traverses a medium the first mover impelling without being impelled, the last moved being impelled without impelling, while the medium (or media, for there are many) is both – so is it also in the case of alteration, except that the agent produces produces it without the patient's changing its place. Thus if an object is dipped into wax, the movement goes on until submersion has taken place, and in stone it goes no distance at all, while in water the disturbance goes far beyond the object dipped: in air the disturbance is propagated farthest of all, the air acting and being acted upon, so long as it maintains an unbroken unity. That is why in the case of reflection it is better, instead of saying that the sight issues from the eye and is reflected, to say that the air, so long as it remains one, is affected by the shape and colour. On a smooth surface the air possesses unity; hence it is that it in turn sets the sight in motion, just as if the impression on the wax were transmitted as far as the wax extends.

13

It is clear that the body of an animal cannot be simple, i.e. consist of one element such as fire or air. For without touch it is

impossible to have any other sense; for every body that has soul in it must, as we have said, be capable of touch. All the other elements with the exception of earth can constitute organs of sense, but all of them bring about perception only through something else, viz. through the media. Touch takes place by direct contact with its objects, whence also its name. All the other organs of sense, no doubt, perceive by contact, only the contact is mediate: touch alone perceives by immediate contact. Consequently no animal body can consist of these other elements.

Nor can it consist solely of earth. For touch is as it were a mean between all tangible qualities, and its organ is capable of receiving not only all the specific qualities which characterize earth, but also the hot and the cold and all other tangible qualities whatsoever. That is why we have no sensation by means of bones, hair, &c., because they consist of earth. So too plants, because they consist of earth, have no sensation. Without touch there can be no other sense, and the organ of touch cannot consist of earth or of any other single element.

It is evident, therefore, that the loss of this one sense alone must bring about the death of an animal. For as on the one hand nothing which is not an animal can have this sense, so on the other it is the only one which is indispensably necessary to what is an animal. This explains, further, the following difference between the other senses and touch. In the case of all the others excess of intensity in the qualities which they apprehend, i.e. excess of intensity in colour, sound, and smell, destroys not the but only the organs of the sense (except incidentally, as when the sound is accompanied by an impact or shock, or where through the objects of sight or of smell certain other things are set in motion, which destroy by contact); flavour also destroys only in so far as it is at the same time tangible. But excess of intensity in tangible qualities, e.g. heat,

cold, or hardness, destroys the animal itself. As in the case of every sensible quality excess destroys the organ, so here what is tangible destroys touch, which is the essential mark of life; for it has been shown that without touch it is impossible for an animal to be. That is why excess in intensity of tangible qualities destroys not merely the organ, but the animal itself, because this is the only sense which it must have.

All the other senses are necessary to animals, as we have said, not for their being, but for their well-being. Such, e.g. is sight, which, since it lives in air or water, or generally in what is pellucid, it must have in order to see, and taste because of what is pleasant or painful to it, in order that it may perceive these qualities in its nutriment and so may desire to be set in motion, and hearing that it may have communication made to it, and a tongue that it may communicate with its fellows.

Aristotle - Parva Naturalia

[Translated by J. I. Beare and G.R.T. Ross]

On Sense and the Sensible

[translated by J. I. Beare]

1

Having now definitely considered the soul, by itself, and its several faculties, we must next make a survey of animals and all living things, in order to ascertain what functions are peculiar, and what functions are common, to them. What has been already determined respecting the soul [sc. by itself] must be assumed throughout. The remaining parts [sc. the attributes of soul and body conjointly] of our subject must be now dealt with, and we may begin with those that come first.

The most important attributes of animals, whether common to all or peculiar to some, are, manifestly, attributes of soul and body in conjunction, e.g. sensation, memory, passion, appetite and desire in general, and, in addition pleasure and pain. For these may, in fact, be said to belong to all animals. But there are, besides these, certain other attributes, of which some are common to all living things, while others are peculiar to certain species of animals. The most important of these may be summed up in four pairs, viz. waking and sleeping, youth and old age, inhalation and exhalation, life and death. We must endeavour to arrive at a scientific conception of these,

determining their respective natures, and the causes of their occurrence.

But it behoves the Physical Philosopher to obtain also a clear view of the first principles of health and disease, inasmuch as neither health nor disease can exist in lifeless things. Indeed we may say of most physical inquirers, and of those physicians who study their art philosophically, that while the former complete their works with a disquisition on medicine, the latter usually base their medical theories on principles derived from Physics.

That all the attributes above enumerated belong to soul and body in conjunction, is obvious; for they all either imply sensation as a concomitant, or have it as their medium. Some are either affections or states of sensation, others, means of defending and safe-guarding it, while others, again, involve its destruction or negation. Now it is clear, alike by reasoning and observation, that sensation is generated in the soul through the medium of the body.

We have already, in our treatise On the Soul, explained the nature of sensation and the act of perceiving by sense, and the reason why this affection belongs to animals. Sensation must, indeed, be attributed to all animals as such, for by its presence or absence we distinguish essentially between what is and what is not an animal.

But coming now to the special senses severally, we may say that touch and taste necessarily appertain to all animals, touch, for the reason given in On the Soul, and taste, because of nutrition. It is by taste that one distinguishes in food the pleasant from the unpleasant, so as to flee from the latter and pursue the former: and savour in general is an affection of nutrient matter.

The senses which operate through external media, viz. smelling, hearing, seeing, are found in all animals which possess the faculty of locomotion. To all that possess them they are a means of preservation; their final cause being that such creatures may, guided by antecedent perception, both pursue their food, and shun things that are bad or destructive. But in animals which have also intelligence they serve for the attainment of a higher perfection. They bring in tidings of many distinctive qualities of things, from which the knowledge of truth, speculative and practical, is generated in the soul.

Of the two last mentioned, seeing, regarded as a supply for the primary wants of life, and in its direct effects, is the superior sense; but for developing intelligence, and in its indirect consequences, hearing takes the precedence. The faculty of seeing, thanks to the fact that all bodies are coloured, brings tidings of multitudes of distinctive qualities of all sorts; whence it is through this sense especially that we perceive the common sensibles, viz. figure, magnitude, motion, number: while hearing announces only the distinctive qualities of sound, and, to some few animals, those also of voice. indirectly, however, it is hearing that contributes most to the growth of intelligence. For rational discourse is a cause of instruction in virtue of its being audible, which it is, not directly, but indirectly; since it is composed of words, and each word is a thought-symbol. Accordingly, of persons destitute from birth of either sense, the blind are more intelligent than the deaf and dumb.

2

Of the distinctive potency of each of the faculties of sense enough has been said already.

But as to the nature of the sensory organs, or parts of the body in which each of the senses is naturally implanted, inquirers now usually take as their guide the fundamental elements of bodies. Not, however, finding it easy to coordinate five senses with four elements, they are at a loss respecting the fifth sense. But they hold the organ of sight to consist of fire, being prompted to this view by a certain sensory affection of whose true cause they are ignorant. This is that, when the eye is pressed or moved, fire appears to flash from it. This naturally takes place in darkness, or when the eyelids are closed, for then, too, darkness is produced.

This theory, however, solves one question only to raise another; for, unless on the hypothesis that a person who is in his full senses can see an object of vision without being aware of it, the eye must on this theory see itself. But then why does the above affection not occur also when the eye is at rest? The true explanation of this affection, which will contain the answer to our question, and account for the current notion that the eye consists of fire, must be determined in the following way: Things which are smooth have the natural property of shining in darkness, without, however, producing light. Now, the part of the eye called 'the black', i.e. its central part, is manifestly smooth. The phenomenon of the flash occurs only when the eye is moved, because only then could it possibly occur that the same one object should become as it were two. The rapidity of the movement has the effect of making that which sees and that which is seen seem different from one another. Hence the phenomenon does not occur unless the motion is rapid and takes place in darkness. For it is in the dark that that which is smooth, e.g. the heads of certain fishes, and the sepia of the cuttle-fish, naturally shines, and, when the movement of the eye is slow, it is impossible that that which sees and that which is seen should appear to be simultaneously two and one. But, in

fact, the eye sees itself in the above phenomenon merely as it does so in ordinary optical reflexion.

If the visual organ proper really were fire, which is the doctrine of Empedocles, a doctrine taught also in the Timaeus, and if vision were the result of light issuing from the eye as from a lantern, why should the eye not have had the power of seeing even in the dark? It is totally idle to say, as the Timaeus does, that the visual ray coming forth in the darkness is quenched. What is the meaning of this 'quenching' of light? That which, like a fire of coals or an ordinary flame, is hot and dry is, indeed, quenched by the moist or cold; but heat and dryness are evidently not attributes of light. Or if they are attributes of it, but belong to it in a degree so slight as to be imperceptible to us, we should have expected that in the daytime the light of the sun should be quenched when rain falls, and that darkness should prevail in frosty weather. Flame, for example, and ignited bodies are subject to such extinction, but experience shows that nothing of this sort happens to the sunlight.

Empedocles at times seems to hold that vision is to be explained as above stated by light issuing forth from the eye, e.g. in the following passage: –

As when one who purposes going abroad prepares a lantern,

A gleam of fire blazing through the stormy night,

Adjusting thereto, to screen it from all sorts of winds,

transparent sides,

Which scatter the breath of the winds as they blow,

While, out through them leaping, the fire,

i.e. all the more subtile part of this,

Shines along his threshold old incessant beams:

So [Divine love] embedded the round "lens", [viz.]

the primaeval fire fenced within the membranes,

In [its own] delicate tissues;

And these fended off the deep surrounding flood,

While leaping forth the fire, i.e. all its more subtile part. –

Sometimes he accounts for vision thus, but at other times he explains it by emanations from the visible objects.

Democritus, on the other hand, is right in his opinion that the eye is of water; not, however, when he goes on to explain seeing as mere mirroring. The mirroring that takes place in an eye is due to the fact that the eye is smooth, and it really has its seat not in the eye which is seen, but in that which sees. For the case is merely one of reflexion. But it would seem that even in his time there was no scientific knowledge of the general subject of the formation of images and the phenomena of reflexion. It is strange too, that it never occurred to him to ask why, if his theory be true, the eye alone sees, while none of the other things in which images are reflected do so.

True, then, the visual organ proper is composed of water, yet vision appertains to it not because it is so composed, but because it is translucent – a property common alike to water and to air. But water is more easily confined and more easily condensed than air; wherefore it is that the pupil, i.e. the eye proper, consists of water. That it does so is proved by facts of actual experience. The substance which flows from eyes when decomposing is seen to be water, and this in undeveloped embryos is remarkably cold and glistening. In sanguineous animals the white of the eye is fat and oily, in order that the

moisture of the eye may be proof against freezing. Wherefore the eye is of all parts of the body the least sensitive to cold: no one ever feels cold in the part sheltered by the eyelids. The eyes of bloodless animals are covered with a hard scale which gives them similar protection.

It is, to state the matter generally, an irrational notion that the eye should see in virtue of something issuing from it; that the visual ray should extend itself all the way to the stars, or else go out merely to a certain point, and there coalesce, as some say, with rays which proceed from the object. It would be better to suppose this coalescence to take place in the fundament of the eye itself. But even this would be mere trifling. For what is meant by the 'coalescence' of light with light? Or how is it possible? Coalescence does not occur between any two things taken at random. And how could the light within the eye coalesce with that outside it? For the environing membrane comes between them.

That without light vision is impossible has been stated elsewhere; but, whether the medium between the eye and its objects is air or light, vision is caused by a process through this medium.

Accordingly, that the inner part of the eye consists of water is easily intelligible, water being translucent.

Now, as vision outwardly is impossible without [extra-organic] light, so also it is impossible inwardly [without light within the organ]. There must, therefore, be some translucent medium within the eye, and, as this is not air, it must be water. The soul or its perceptive part is not situated at the external surface of the eye, but obviously somewhere within: whence the necessity of the interior of the eye being translucent, i.e. capable of admitting light. And that it is so is plain from actual occurrences. It is matter of experience that soldiers wounded in

battle by a sword slash on the temple, so inflicted as to sever the passages of [i.e. inward from] the eye, feel a sudden onset of darkness, as if a lamp had gone out; because what is called the pupil, i.e. the translucent, which is a sort of inner lamp, is then cut off [from its connexion with the soul].

Hence, if the facts be at all as here stated, it is clear that – if one should explain the nature of the sensory organs in this way, i.e. by correlating each of them with one of the four elements, – we must conceive that the part of the eye immediately concerned in vision consists of water, that the part immediately concerned in the perception of sound consists of air, and that the sense of smell consists of fire. (I say the sense of smell, not the organ.) For the organ of smell is only potentially that which the sense of smell, as realized, is actually; since the object of sense is what causes the actualization of each sense, so that it (the sense) must (at the instant of actualization) be (actually) that which before (the moment of actualization) it was potentially. Now, odour is a smoke-like evaporation, and smoke-like evaporation arises from fire. This also helps us to understand why the olfactory organ has its proper seat in the environment of the brain, for cold matter is potentially hot. In the same way must the genesis of the eye be explained. Its structure is an offshoot from the brain, because the latter is the moistest and coldest of all the bodily parts.

The organ of touch proper consists of earth, and the faculty of taste is a particular form of touch. This explains why the sensory organ of both touch and taste is closely related to the heart. For the heart as being the hottest of all the bodily parts, is the counterpoise of the brain.

This then is the way in which the characteristics of the bodily organs of sense must be determined.

3

Of the sensibles corresponding to each sensory organ, viz. colour, sound, odour, savour, touch, we have treated in On the Soul in general terms, having there determined what their function is, and what is implied in their becoming actualized in relation to their respective organs. We must next consider what account we are to give of any one of them; what, for example, we should say colour is, or sound, or odour, or savour; and so also respecting [the object of] touch. We begin with colour.

Now, each of them may be spoken of from two points of view, i.e. either as actual or as potential. We have in On the Soul explained in what sense the colour, or sound, regarded as actualized [for sensation] is the same as, and in what sense it is different from, the correlative sensation, the actual seeing or hearing. The point of our present discussion is, therefore, to determine what each sensible object must be in itself, in order to be perceived as it is in actual consciousness.

We have already in On the Soul stated of Light that it is the colour of the Translucent, [being so related to it] incidentally; for whenever a fiery element is in a translucent medium presence there is Light; while the privation of it is Darkness. But the 'Translucent', as we call it, is not something peculiar to air, or water, or any other of the bodies usually called translucent, but is a common 'nature' and power, capable of no separate existence of its own, but residing in these, and subsisting likewise in all other bodies in a greater or less degree. As the bodies in which it subsists must have some extreme bounding surface, so too must this. Here, then, we may say that Light is a 'nature' inhering in the Translucent when the latter is without determinate boundary. But it is manifest that, when the Translucent is in determinate bodies, its bounding extreme

must be something real; and that colour is just this ‘something’ we are plainly taught by facts – colour being actually either at the external limit, or being itself that limit, in bodies. Hence it was that the Pythagoreans named the superficies of a body its ‘hue’, for ‘hue’, indeed, lies at the limit of the body; but the limit of the body; is not a real thing; rather we must suppose that the same natural substance which, externally, is the vehicle of colour exists [as such a possible vehicle] also in the interior of the body.

Air and water, too [i.e. as well as determinately bounded bodies] are seen to possess colour; for their brightness is of the nature of colour. But the colour which air or sea presents, since the body in which it resides is not determinately bounded, is not the same when one approaches and views it close by as it is when one regards it from a distance; whereas in determinate bodies the colour presented is definitely fixed, unless, indeed, when the atmospheric environment causes it to change. Hence it is clear that that in them which is susceptible of colour is in both cases the same. It is therefore the Translucent, according to the degree to which it subsists in bodies (and it does so in all more or less), that causes them to partake of colour. But since the colour is at the extremity of the body, it must be at the extremity of the Translucent in the body. Whence it follows that we may define colour as the limit of the Translucent in determinately bounded body. For whether we consider the special class of bodies called translucent, as water and such others, or determinate bodies, which appear to possess a fixed colour of their own, it is at the exterior bounding surface that all alike exhibit their colour.

Now, that which when present in air produces light may be present also in the Translucent which pervades determinate bodies; or again, it may not be present, but there may be a privation of it. Accordingly, as in the case of air the one

condition is light, the other darkness, in the same way the colours White and Black are generated in determinate bodies.

We must now treat of the other colours, reviewing the several hypotheses invented to explain their genesis.

(1) It is conceivable that the White and the Black should be juxtaposed in quantities so minute that [a particle of] either separately would be invisible, though the joint product [of two particles, a black and a white] would be visible; and that they should thus have the other colours for resultants. Their product could, at all events, appear neither white nor black; and, as it must have some colour, and can have neither of these, this colour must be of a mixed character – in fact, a species of colour different from either. Such, then, is a possible way of conceiving the existence of a plurality of colours besides the White and Black; and we may suppose that [of this 'plurality'] many are the result of a [numerical] ratio; for the blacks and whites may be juxtaposed in the ratio of 3 to 2 or of 3 to 4, or in ratios expressible by other numbers; while some may be juxtaposed according to no numerically expressible ratio, but according to some relation of excess or defect in which the blacks and whites involved would be incommensurable quantities; and, accordingly, we may regard all these colours [viz. all those based on numerical ratios] as analogous to the sounds that enter into music, and suppose that those involving simple numerical ratios, like the concords in music, may be those generally regarded as most agreeable; as, for example, purple, crimson, and some few such colours, their fewness being due to the same causes which render the concords few. The other compound colours may be those which are not based on numbers. Or it may be that, while all colours whatever [except black and white] are based on numbers, some are regular in this respect, others irregular; and that the latter [though now supposed to be all based on numbers], whenever they are not

pure, owe this character to a corresponding impurity in [the arrangement of] their numerical ratios. This then is one conceivable hypothesis to explain the genesis of intermediate colours.

(2) Another is that the Black and White appear the one through the medium of the other, giving an effect like that sometimes produced by painters overlaying a less vivid upon a more vivid colour, as when they desire to represent an object appearing under water or enveloped in a haze, and like that produced by the sun, which in itself appears white, but takes a crimson hue when beheld through a fog or a cloud of smoke. On this hypothesis, too, a variety of colours may be conceived to arise in the same way as that already described; for between those at the surface and those underneath a definite ratio might sometimes exist; in other cases they might stand in no determinate ratio. To [introduce a theory of colour which would set all these hypotheses aside, and] say with the ancients that colours are emanations, and that the visibility of objects is due to such a cause, is absurd. For they must, in any case, explain sense-perception through Touch; so that it were better to say at once that visual perception is due to a process set up by the perceived object in the medium between this object and the sensory organ; due, that is, to contact [with the medium affected,] not to emanations.

If we accept the hypothesis of juxtaposition, we must assume not only invisible magnitude, but also imperceptible time, in order that the succession in the arrival of the stimulatory movements may be unperceived, and that the compound colour seen may appear to be one, owing to its successive parts seeming to present themselves at once. On the hypothesis of superposition, however, no such assumption is needful: the stimulatory process produced in the medium by the upper colour, when this is itself unaffected, will be different in kind

from that produced by it when affected by the underlying colour. Hence it presents itself as a different colour, i.e. as one which is neither white nor black. So that, if it is impossible to suppose any magnitude to be invisible, and we must assume that there is some distance from which every magnitude is visible, this superposition theory, too [i.e. as well as No. 3 infra], might pass as a real theory of colour-mixture. Indeed, in the previous case also there is no reason why, to persons at a distance from the juxtaposed blacks and whites, some one colour should not appear to present itself as a blend of both. [But it would not be so on a nearer view], for it will be shown, in a discussion to be undertaken later on, that there is no magnitude absolutely invisible.

(3) There is a mixture of bodies, however, not merely such as some suppose, i.e. by juxtaposition of their minimal parts, which, owing to [the weakness of our] sense, are imperceptible by us, but a mixture by which they [i.e. the 'matter' of which they consist] are wholly blent together by interpenetration, as we have described it in the treatise on Mixture, where we dealt with this subject generally in its most comprehensive aspect. For, on the supposition we are criticizing, the only totals capable of being mixed are those which are divisible into minimal parts, [e.g. genera into individuals] as men, horses, or the [various kinds of] seeds. For of mankind as a whole the individual man is such a least part; of horses [as an aggregate] the individual horse. Hence by the juxtaposition of these we obtain a mixed total, consisting [like a troop of cavalry] of both together; but we do not say that by such a process any individual man has been mixed with any individual horse. Not in this way, but by complete interpenetration [of their matter], must we conceive those things to be mixed which are not divisible into minima; and it is in the case of these that natural mixture exhibits itself in its most perfect form. We have explained already in our discourse 'On Mixture' how such mixture is possible. This being

the true nature of mixture, it is plain that when bodies are mixed their colours also are necessarily mixed at the same time; and [it is no less plain] that this is the real cause determining the existence of a plurality of colours – not superposition or juxtaposition. For when bodies are thus mixed, their resultant colour presents itself as one and the same at all distances alike; not varying as it is seen nearer or farther away.

Colours will thus, too [as well as on the former hypotheses], be many in number on account of the fact that the ingredients may be combined with one another in a multitude of ratios; some will be based on determinate numerical ratios, while others again will have as their basis a relation of quantitative excess or defect not expressible in integers. And all else that was said in reference to the colours, considered as juxtaposed or superposed, may be said of them likewise when regarded as mixed in the way just described.

Why colours, as well as savours and sounds, consist of species determinate [in themselves] and not infinite [in number] is a question which we shall discuss hereafter.

4

We have now explained what colour is, and the reason why there are many colours; while before, in our work On the Soul, we explained the nature of sound and voice. We have next to speak of Odour and Savour, both of which are almost the same physical affection, although they each have their being in different things. Savours, as a class, display their nature more clearly to us than Odours, the cause of which is that the olfactory sense of man is inferior in acuteness to that of the lower animals, and is, when compared with our other senses,

the least perfect of Man's sense of Touch, on the contrary, excels that of all other animals in fineness, and Taste is a modification of Touch.

Now the natural substance water per se tends to be tasteless. But [since without water tasting is impossible] either (a) we must suppose that water contains in itself [uniformly diffused through it] the various kinds of savour, already formed, though in amounts so small as to be imperceptible, which is the doctrine of Empedocles; or (b) the water must be a sort of matter, qualified, as it were, to produce germs of savours of all kinds, so that all kinds of savour are generated from the water, though different kinds from its different parts, or else (c) the water is in itself quite undifferentiated in respect of savour [whether developed or undeveloped], but some agent, such for example as one might conceive Heat or the Sun to be, is the efficient cause of savour.

(a) Of these three hypotheses, the falsity of that held by Empedocles is only too evident. For we see that when pericarpal fruits are plucked [from the tree] and exposed in the sun, or subjected to the action of fire, their sapid juices are changed by the heat, which shows that their qualities are not due to their drawing anything from the water in the ground, but to a change which they undergo within the pericarp itself; and we see, moreover, that these juices, when extracted and allowed to lie, instead of sweet become by lapse of time harsh or bitter, or acquire savours of any and every sort; and that, again, by the process of boiling or fermentation they are made to assume almost all kinds of new savours.

(b) It is likewise impossible that water should be a material qualified to generate all kinds of Savour germs [so that different savours should arise out of different parts of the water]; for we

see different kinds of taste generated from the same water, having it as their nutriment.

(C) It remains, therefore, to suppose that the water is changed by passively receiving some affection from an external agent. Now, it is manifest that water does not contract the quality of sapidity from the agency of Heat alone. For water is of all liquids the thinnest, thinner even than oil itself, though oil, owing to its viscosity, is more ductile than water, the latter being uncohesive in its particles; whence water is more difficult than oil to hold in the hand without spilling. But since perfectly pure water does not, when subjected to the action of Heat, show any tendency to acquire consistency, we must infer that some other agency than heat is the cause of sapidity. For all savours [i.e. sapid liquors] exhibit a comparative consistency. Heat is, however, a coagent in the matter.

Now the sapid juices found in pericarpal fruits evidently exist also in the earth. Hence many of the old natural philosophers assert that water has qualities like those of the earth through which it flows, a fact especially manifest in the case of saline springs, for salt is a form of earth. Hence also when liquids are filtered through ashes, a bitter substance, the taste they yield is bitter. There are many wells, too, of which some are bitter, others acid, while others exhibit other tastes of all kinds.

As was to be anticipated, therefore, it is in the vegetable kingdom that tastes occur in richest variety. For, like all things else, the Moist, by nature's law, is affected only by its contrary; and this contrary is the Dry. Thus we see why the Moist is affected by Fire, which as a natural substance, is dry. Heat is, however, the essential property of Fire, as Dryness is of Earth, according to what has been said in our treatise on the elements. Fire and Earth, therefore, taken absolutely as such, have no natural power to affect, or be affected by, one another; nor have

any other pair of substances. Any two things can affect, or be affected by, one another only so far as contrariety to the other resides in either of them.

As, therefore, persons washing Colours or Savours in a liquid cause the water in which they wash to acquire such a quality [as that of the colour or savour], so nature, too, by washing the Dry and Earthy in the Moist, and by filtering the latter, that is, moving it on by the agency of heat through the dry and earthy, imparts to it a certain quality. This affection, wrought by the aforesaid Dry in the Moist, capable of transforming the sense of Taste from potentiality to actuality, is Savour. Savour brings into actual exercise the perceptive faculty which pre-existed only in potency. The activity of sense-perception in general is analogous, not to the process of acquiring knowledge, but to that of exercising knowledge already acquired.

That Savours, either as a quality or as the privation of a quality, belong not to every form of the Dry but to the Nutrient, we shall see by considering that neither the Dry without the Moist, nor the Moist without the Dry, is nutrient. For no single element, but only composite substance, constitutes nutriment for animals. Now, among the perceptible elements of the food which animals assimilate, the tangible are the efficient causes of growth and decay; it is qua hot or cold that the food assimilated causes these; for the heat or cold is the direct cause of growth or decay. It is qua gustable, however, that the assimilated food supplies nutrition. For all organisms are nourished by the Sweet [i.e. the 'gustable' proper], either by itself or in combination with other savours. Of this we must speak with more precise detail in our work on Generation: for the present we need touch upon it only so far as our subject here requires. Heat causes growth, and fits the food-stuff for alimentation; it attracts [into the organic system] that which is light [viz. the sweet], while the salt and bitter it rejects because of their heaviness. In fact, whatever

effects external heat produces in external bodies, the same are produced by their internal heat in animal and vegetable organisms. Hence it is [i.e. by the agency of heat as described] that nourishment is effected by the sweet. The other savours are introduced into and blended in food [naturally] on a principle analogous to that on which the saline or the acid is used artificially, i.e. for seasoning. These latter are used because they counteract the tendency of the sweet to be too nutrient, and to float on the stomach.

As the intermediate colours arise from the mixture of white and black, so the intermediate savours arise from the Sweet and Bitter; and these savours, too, severally involve either a definite ratio, or else an indefinite relation of degree, between their components, either having certain integral numbers at the basis of their mixture, and, consequently, of their stimulative effect, or else being mixed in proportions not arithmetically expressible. The tastes which give pleasure in their combination are those which have their components joined in a definite ratio.

The sweet taste alone is Rich, [therefore the latter may be regarded as a variety of the former], while [so far as both imply privation of the Sweet] the Saline is fairly identical with the Bitter. Between the extremes of sweet and bitter come the Harsh, the Pungent, the Astringent, and the Acid. Savours and Colours, it will be observed, contain respectively about the same number of species. For there are seven species of each, if, as is reasonable, we regard Dun [or Grey] as a variety of Black (for the alternative is that Yellow should be classed with White, as Rich with Sweet); while [the irreducible colours, viz.] Crimson, Violet, leek-Green, and deep Blue, come between White and Black, and from these all others are derived by mixture.

Again, as Black is a privation of White in the Translucent, so Saline or Bitter is a privation of Sweet in the Nutrient Moist. This explains why the ash of all burnt things is bitter; for the potable [sc. the sweet] moisture has been exuded from them.

Democritus and most of the natural philosophers who treat of sense-perception proceed quite irrationally, for they represent all objects of sense as objects of Touch. Yet, if this is really so, it clearly follows that each of the other senses is a mode of Touch; but one can see at a glance that this is impossible.

Again, they treat the percepts common to all senses as proper to one. For [the qualities by which they explain taste viz.] Magnitude and Figure, Roughness and Smoothness, and, moreover, the Sharpness and Bluntness found in solid bodies, are percepts common to all the senses, or if not to all, at least to Sight and Touch. This explains why it is that the senses are liable to err regarding them, while no such error arises respecting their proper sensibles; e.g. the sense of Seeing is not deceived as to Colour, nor is that of Hearing as to Sound.

On the other hand, they reduce the proper to common sensibles, as Democritus does with White and Black; for he asserts that the latter is [a mode of the] rough, and the former [a mode of the] smooth, while he reduces Savours to the atomic figures. Yet surely no one sense, or, if any, the sense of Sight rather than any other, can discern the common sensibles. But if we suppose that the sense of Taste is better able to do so, then – since to discern the smallest objects in each kind is what marks the acutest sense. – Taste should have been the sense which best perceived the common sensibles generally, and showed the most perfect power of discerning figures in general.

Again, all the sensibles involve contrariety; e.g. in Colour White is contrary to Black, and in Savours Bitter is contrary to Sweet; but no one figure is reckoned as contrary to any other figure.

Else, to which of the possible polygonal figures [to which Democritus reduces Bitter] is the spherical figure [to which he reduces Sweet] contrary?

Again, since figures are infinite in number, savours also should be infinite; [the possible rejoinder – 'that they are so, only that some are not perceived' – cannot be sustained] for why should one savour be perceived, and another not?

This completes our discussion of the object of Taste, i.e. Savour; for the other affections of Savours are examined in their proper place in connection with the natural history of Plants.

5

Our conception of the nature of Odours must be analogous to that of Savours; inasmuch as the Sapid Dry effects in air and water alike, but in a different province of sense, precisely what the Dry effects in the Moist of water only. We customarily predicate Translucency of both air and water in common; but it is not qua translucent that either is a vehicle of odour, but qua possessed of a power of washing or rinsing [and so imbibing] the Sapid Dryness.

For the object of Smell exists not in air only: it also exists in water. This is proved by the case of fishes and testacea, which are seen to possess the faculty of smell, although water contains no air (for whenever air is generated within water it rises to the surface), and these creatures do not respire. Hence, if one were to assume that air and water are both moist, it would follow that Odour is the natural substance consisting of the Sapid Dry diffused in the Moist, and whatever is of this kind would be an object of Smell.

That the property of odorousness is based upon the Sapid may be seen by comparing the things which possess with those which do not possess odour. The elements, viz. Fire, Air, Earth, Water, are inodorous, because both the dry and the moist among them are without sapidity, unless some added ingredient produces it. This explains why sea-water possesses odour, for [unlike 'elemental' water] it contains savour and dryness. Salt, too, is more odorous than natron, as the oil which exudes from the former proves, for natron is allied to ['elemental'] earth more nearly than salt. Again, a stone is inodorous, just because it is tasteless, while, on the contrary, wood is odorous, because it is sapid. The kinds of wood, too, which contain more ['elemental'] water are less odorous than others. Moreover, to take the case of metals, gold is inodorous because it is without taste, but bronze and iron are odorous; and when the [sapid] moisture has been burnt out of them, their slag is, in all cases, less odorous the metals [than the metals themselves]. Silver and tin are more odorous than the one class of metals, less so than the other, inasmuch as they are water [to a greater degree than the former, to a less degree than the latter].

Some writers look upon Fumid exhalation, which is a compound of Earth and Air, as the essence of Odour. [Indeed all are inclined to rush to this theory of Odour.] Heraclitus implied his adherence to it when he declared that if all existing things were turned into Smoke, the nose would be the organ to discern them with. All writers incline to refer odour to this cause [sc. exhalation of some sort], but some regard it as aqueous, others as fumid, exhalation; while others, again, hold it to be either. Aqueous exhalation is merely a form of moisture, but fumid exhalation is, as already remarked, composed of Air and Earth. The former when condensed turns into water; the latter, in a particular species of earth. Now, it is unlikely that odour is either of these. For vaporous exhalation consists of mere water

[which, being tasteless, is inodorous]; and fumid exhalation cannot occur in water at all, though, as has been before stated, aquatic creatures also have the sense of smell.

Again, the exhalation theory of odour is analogous to the theory of emanations. If, therefore, the latter is untenable, so, too, is the former.

It is clearly conceivable that the Moist, whether in air (for air, too, is essentially moist) or in water, should imbibe the influence of, and have effects wrought in it by, the Sapid Dryness. Moreover, if the Dry produces in moist media, i.e. water and air, an effect as of something washed out in them, it is manifest that odours must be something analogous to savours. Nay, indeed, this analogy is, in some instances, a fact [registered in language]; for odours as well as savours are spoken of as pungent, sweet, harsh, astringent rich [='savoury']; and one might regard fetid smells as analogous to bitter tastes; which explains why the former are offensive to inhalation as the latter are to deglutition. It is clear, therefore, that Odour is in both water and air what Savour is in water alone. This explains why coldness and freezing render Savours dull, and abolish odours altogether; for cooling and freezing tend to annul the kinetic heat which helps to fabricate sapidity.

There are two species of the Odorous. For the statement of certain writers that the odorous is not divisible into species is false; it is so divisible. We must here define the sense in which these species are to be admitted or denied.

One class of odours, then, is that which runs parallel, as has been observed, to savours: to odours of this class their pleasantness or unpleasantness belongs incidentally. For owing to the fact that Savours are qualities of nutrient matter, the odours connected with these [e.g. those of a certain food] are agreeable as long as animals have an appetite for the food, but

they are not agreeable to them when sated and no longer in want of it; nor are they agreeable, either, to those animals that do not like the food itself which yields the odours. Hence, as we observed, these odours are pleasant or unpleasant incidentally, and the same reasoning explains why it is that they are perceptible to all animals in common.

The other class of odours consists of those agreeable in their essential nature, e.g. those of flowers. For these do not in any degree stimulate animals to food, nor do they contribute in any way to appetite; their effect upon it, if any, is rather the opposite. For the verse of Strattis ridiculing Euripides –

Use not perfumery to flavour soup, contains a truth.

Those who nowadays introduce such flavours into beverages deforce our sense of pleasure by habituating us to them, until, from two distinct kinds of sensations combined, pleasure arises as it might from one simple kind.

Of this species of odour man alone is sensible; the other, viz. that correlated with Tastes, is, as has been said before, perceptible also to the lower animals. And odours of the latter sort, since their pleasureableness depends upon taste, are divided into as many species as there are different tastes; but we cannot go on to say this of the former kind of odour, since its nature is agreeable or disagreeable per se. The reason why the perception of such odours is peculiar to man is found in the characteristic state of man's brain. For his brain is naturally cold, and the blood which it contains in its vessels is thin and pure but easily cooled (whence it happens that the exhalation arising from food, being cooled by the coldness of this region, produces unhealthy rheums); therefore it is that odours of such a species have been generated for human beings, as a safeguard to health. This is their sole function, and that they perform it is evident. For food, whether dry or moist, though sweet to taste, is

often unwholesome; whereas the odour arising from what is fragrant, that odour which is pleasant in its own right, is, so to say, always beneficial to persons in any state of bodily health whatever.

For this reason, too, the perception of odour [in general] effected through respiration, not in all animals, but in man and certain other sanguineous animals, e.g. quadrupeds, and all that participate freely in the natural substance air; because when odours, on account of the lightness of the heat in them, mount to the brain, the health of this region is thereby promoted. For odour, as a power, is naturally heat-giving. Thus Nature has employed respiration for two purposes: primarily for the relief thereby brought to the thorax, secondarily for the inhalation of odour. For while an animal is inhaling, – odour moves in through its nostrils, as it were 'from a side-entrance.'

But the perception of the second class of odours above described [does not belong to all animal, but] is confined to human beings, because man's brain is, in proportion to his whole bulk, larger and moister than the brain of any other animal. This is the reason of the further fact that man alone, so to speak, among animals perceives and takes pleasure in the odours of flowers and such things. For the heat and stimulation set up by these odours are commensurate with the excess of moisture and coldness in his cerebral region. On all the other animals which have lungs, Nature has bestowed their due perception of one of the two kinds of odour [i.e. that connected with nutrition] through the act of respiration, guarding against the needless creation of two organs of sense; for in the fact that they respire the other animals have already sufficient provision for their perception of the one species of odour only, as human beings have for their perception of both.

But that creatures which do not respire have the olfactory sense is evident. For fishes, and all insects as a class, have, thanks to the species of odour correlated with nutrition, a keen olfactory sense of their proper food from a distance, even when they are very far away from it; such is the case with bees, and also with the class of small ants, which some denominate knipes. Among marine animals, too, the murex and many other similar animals have an acute perception of their food by its odour.

It is not equally certain what the organ is whereby they so perceive. This question, of the organ whereby they perceive odour, may well cause a difficulty, if we assume that smelling takes place in animals only while respiring (for that this is the fact is manifest in all the animals which do respire), whereas none of those just mentioned respires, and yet they have the sense of smell – unless, indeed, they have some other sense not included in the ordinary five. This supposition is, however, impossible. For any sense which perceives odour is a sense of smell, and this they do perceive, though probably not in the same way as creatures which respire, but when the latter are respiring the current of breath removes something that is laid like a lid upon the organ proper (which explains why they do not perceive odours when not respiring); while in creatures which do not respire this is always off: just as some animals have eyelids on their eyes, and when these are not raised they cannot see, whereas hard-eyed animals have no lids, and consequently do not need, besides eyes, an agency to raise the lids, but see straightway [without intermission] from the actual moment at which it is first possible for them to do so [i.e. from the moment when an object first comes within their field of vision].

Consistently with what has been said above, not one of the lower animals shows repugnance to the odour of things which are essentially ill-smelling, unless one of the latter is positively

pernicious. They are destroyed, however, by these things, just as human beings are; i.e. as human beings get headaches from, and are often asphyxiated by, the fumes of charcoal, so the lower animals perish from the strong fumes of brimstone and bituminous substances; and it is owing to experience of such effects that they shun these. For the disagreeable odour in itself they care nothing whatever (though the odours of many plants are essentially disagreeable), unless, indeed, it has some effect upon the taste of their food.

The senses making up an odd number, and an odd number having always a middle unit, the sense of smell occupies in itself as it were a middle position between the tactual senses, i.e. Touch and Taste, and those which perceive through a medium, i.e. Sight and Hearing. Hence the object of smell, too, is an affection of nutrient substances (which fall within the class of Tangibles), and is also an affection of the audible and the visible; whence it is that creatures have the sense of smell both in air and water. Accordingly, the object of smell is something common to both of these provinces, i.e. it appertains both to the tangible on the one hand, and on the other to the audible and translucent. Hence the propriety of the figure by which it has been described by us as an immersion or washing of dryness in the Moist and Fluid. Such then must be our account of the sense in which one is or is not entitled to speak of the odorous as having species.

The theory held by certain of the Pythagoreans, that some animals are nourished by odours alone, is unsound. For, in the first place, we see that food must be composite, since the bodies nourished by it are not simple. This explains why waste matter is secreted from food, either within the organisms, or, as in plants, outside them. But since even water by itself alone, that is, when unmixed, will not suffice for food – for anything which is to form a consistency must be corporeal – , it is still much less

conceivable that air should be so corporealized [and thus fitted to be food]. But, besides this, we see that all animals have a receptacle for food, from which, when it has entered, the body absorbs it. Now, the organ which perceives odour is in the head, and odour enters with the inhalation of the breath; so that it goes to the respiratory region. It is plain, therefore, that odour, qua odour, does not contribute to nutrition; that, however, it is serviceable to health is equally plain, as well by immediate perception as from the arguments above employed; so that odour is in relation to general health what savour is in the province of nutrition and in relation to the bodies nourished.

This then must conclude our discussion of the several organs of sense-perception.

6

One might ask: if every body is infinitely divisible, are its sensible qualities – Colour, Savour, Odour, Sound, Weight, Cold or Heat, [Heaviness or] Lightness, Hardness or Softness – also infinitely divisible? Or, is this impossible?

[One might well ask this question], because each of them is productive of sense-perception, since, in fact, all derive their name [of 'sensible qualities'] from the very circumstance of their being able to stimulate this. Hence, [if this is so] both our perception of them should likewise be divisible to infinity, and every part of a body [however small] should be a perceptible magnitude. For it is impossible, e.g. to see a thing which is white but not of a certain magnitude.

Since if it were not so, [if its sensible qualities were not divisible, pari passu with body], we might conceive a body existing but

having no colour, or weight, or any such quality; accordingly not perceptible at all. For these qualities are the objects of sense-perception. On this supposition, every perceptible object should be regarded as composed not of perceptible [but of imperceptible] parts. Yet it must [be really composed of perceptible parts], since assuredly it does not consist of mathematical [and therefore purely abstract and non-sensible] quantities. Again, by what faculty should we discern and cognize these [hypothetical real things without sensible qualities]? Is it by Reason? But they are not objects of Reason; nor does reason apprehend objects in space, except when it acts in conjunction with sense-perception. At the same time, if this be the case [that there are magnitudes, physically real, but without sensible quality], it seems to tell in favour of the atomistic hypothesis; for thus, indeed, [by accepting this hypothesis], the question [with which this chapter begins] might be solved [negatively]. But it is impossible [to accept this hypothesis]. Our views on the subject of atoms are to be found in our treatise on Movement.

The solution of these questions will bring with it also the answer to the question why the species of Colour, Taste, Sound, and other sensible qualities are limited. For in all classes of things lying between extremes the intermediates must be limited. But contraries are extremes, and every object of sense-perception involves contrariety: e.g. in Colour, White x Black; in Savour, Sweet x Bitter, and in all the other sensibles also the contraries are extremes. Now, that which is continuous is divisible into an infinite number of unequal parts, but into a finite number of equal parts, while that which is not per se continuous is divisible into species which are finite in number. Since then, the several sensible qualities of things are to be reckoned as species, while continuity always subsists in these, we must take account of the difference between the Potential and the Actual. It is owing to this difference that we do not

[actually] see its ten-thousandth part in a grain of millet, although sight has embraced the whole grain within its scope; and it is owing to this, too, that the sound contained in a quarter-tone escapes notice, and yet one hears the whole strain, inasmuch as it is a continuum; but the interval between the extreme sounds [that bound the quarter-tone] escapes the ear [being only potentially audible, not actually]. So, in the case of other objects of sense, extremely small constituents are unnoticed; because they are only potentially not actually [perceptible e.g.] visible, unless when they have been parted from the wholes. So the footlength too exists potentially in the two-foot length, but actually only when it has been separated from the whole. But objective increments so small as those above might well, if separated from their totals, [instead of achieving 'actual' exisistence] be dissolved in their environments, like a drop of sapid moisture poured out into the sea. But even if this were not so [sc. with the objective magnitude], still, since the [subjective] of sense-perception is not perceptible in itself, nor capable of separate existence (since it exists only potentially in the more distinctly perceivable whole of sense-perception), so neither will it be possible to perceive [actually] its correlatively small object [sc. its quantum of pathema or sensible quality] when separated from the object-total. But yet this [small object] is to be considered as perceptible: for it is both potentially so already [i.e. even when alone], and destined to be actually so when it has become part of an aggregate. Thus, therefore, we have shown that some magnitudes and their sensible qualities escape notice, and the reason why they do so, as well as the manner in which they are still perceptible or not perceptible in such cases. Accordingly then when these [minutely subdivided] sensibles have once again become aggregated in a whole in such a manner, relatively to one another, as to be perceptible actually, and not merely because they are in the whole, but even apart from it, it

follows necessarily [from what has been already stated] that their sensible qualities, whether colours or tastes or sounds, are limited in number.

One might ask: – do the objects of sense-perception, or the movements proceeding from them ([since movements there are,] in whichever of the two ways [viz. by emanations or by stimulatory kinesis] sense-perception takes place), when these are actualized for perception, always arrive first at a spatial middle point [between the sense-organ and its object], as Odour evidently does, and also Sound? For he who is nearer [to the odorous object] perceives the Odour sooner [than who is farther away], and the Sound of a stroke reaches us some time after it has been struck. Is it thus also with an object seen, and with Light? Empedocles, for example, says that the Light from the Sun arrives first in the intervening space before it comes to the eye, or reaches the Earth. This might plausibly seem to be the case. For whatever is moved [in space], is moved from one place to another; hence there must be a corresponding interval of time also in which it is moved from the one place to the other. But any given time is divisible into parts; so that we should assume a time when the sun's ray was not as yet seen, but was still travelling in the middle space.

Now, even if it be true that the acts of 'hearing' and 'having heard', and, generally, those of 'perceiving' and 'having perceived', form co-instantaneous wholes, in other words, that acts of sense-perception do not involve a process of becoming, but have their being none the less without involving such a process; yet, just as, [in the case of sound], though the stroke which causes the Sound has been already struck, the Sound is not yet at the ear (and that this last is a fact is further proved by the transformation which the letters [viz. the consonants as heard] undergo [in the case of words spoken from a distance], implying that the local movement [involved in Sound] takes

place in the space between [us and the speaker]; for the reason why [persons addressed from a distance] do not succeed in catching the sense of what is said is evidently that the air [sound wave] in moving towards them has its form changed) [granting this, then, the question arises]: is the same also true in the case of Colour and Light? For certainly it is not true that the beholder sees, and the object is seen, in virtue of some merely abstract relationship between them, such as that between equals. For if it were so, there would be no need [as there is] that either [the beholder or the thing beheld] should occupy some particular place; since to the equalization of things their being near to, or far from, one another makes no difference.

Now this [travelling through successive positions in the medium] may with good reason take place as regards Sound and Odour, for these, like [their media] Air and Water, are continuous, but the movement of both is divided into parts. This too is the ground of the fact that the object which the person first in order of proximity hears or smells is the same as that which each subsequent person perceives, while yet it is not the same.

Some, indeed, raise a question also on these very points; they declare it impossible that one person should hear, or see, or smell, the same object as another, urging the impossibility of several persons in different places hearing or smelling [the same object], for the one same thing would [thus] be divided from itself. The answer is that, in perceiving the object which first set up the motion – e.g. a bell, or frankincense, or fire – all perceive an object numerically one and the same; while, of course, in the special object perceived they perceive an object numerically different for each, though specifically the same for all; and this, accordingly, explains how it is that many persons together see, or smell, or hear [the same object]. These things [the odour or sound proper] are not bodies, but an affection or

process of some kind (otherwise this [viz. simultaneous perception of the one object by many] would not have been, as it is, a fact of experience) though, on the other hand, they each imply a body [as their cause].

But [though sound and odour may travel,] with regard to Light the case is different. For Light has its raison d'etre in the being [not becoming] of something, but it is not a movement. And in general, even in qualitative change the case is different from what it is in local movement [both being different species of kinesis]. Local movements, of course, arrive first at a point midway before reaching their goal (and Sound, it is currently believed, is a movement of something locally moved), but we cannot go on to assert this [arrival at a point midway] like manner of things which undergo qualitative change. For this kind of change may conceivably take place in a thing all at once, without one half of it being changed before the other; e.g. it is conceivable that water should be frozen simultaneously in every part. But still, for all that, if the body which is heated or frozen is extensive, each part of it successively is affected by the part contiguous, while the part first changed in quality is so changed by the cause itself which originates the change, and thus the change throughout the whole need not take place coinstantaneously and all at once. Tasting would have been as smelling now is, if we lived in a liquid medium, and perceived [the sapid object] at a distance, before touching it.

Naturally, then, the parts of media between a sensory organ and its object are not all affected at once – except in the case of Light [illumination] for the reason above stated, and also in the case of seeing, for the same reason; for Light is an efficient cause of seeing.

7

Another question respecting sense-perception is as follows: assuming, as is natural, that of two [simultaneous] sensory stimuli the stronger always tends to extrude the weaker [from consciousness], is it conceivable or not that one should be able to discern two objects coinstantaneously in the same individual time? The above assumption explains why persons do not perceive what is brought before their eyes, if they are at the time deep in thought, or in a fright, or listening to some loud noise. This assumption, then, must be made, and also the following: that it is easier to discern each object of sense when in its simple form than when an ingredient in a mixture; easier, for example, to discern wine when neat than when blended, and so also honey, and [in other provinces] a colour, or to discern the nete by itself alone, than [when sounded with the hypate] in the octave; the reason being that component elements tend to efface [the distinctive characteristics of] one another. Such is the effect [on one another] of all ingredients of which, when compounded, some one thing is formed.

If, then, the greater stimulus tends to expel the less, it necessarily follows that, when they concur, this greater should itself too be less distinctly perceptible than if it were alone, since the less by blending with it has removed some of its individuality, according to our assumption that simple objects are in all cases more distinctly perceptible.

Now, if the two stimuli are equal but heterogeneous, no perception of either will ensue; they will alike efface one another's characteristics. But in such a case the perception of either stimulus in its simple form is impossible. Hence either there will then be no sense-perception at all, or there will be a perception compounded of both and differing from either. The latter is what actually seems to result from ingredients blended

together, whatever may be the compound in which they are so mixed.

Since, then, from some concurrent [sensory stimuli] a resultant object is produced, while from others no such resultant is produced, and of the latter sort are those things which belong to different sense provinces (for only those things are capable of mixture whose extremes are contraries, and no one compound can be formed from, e.g. White and Sharp, except indirectly, i.e. not as a concord is formed of Sharp and Grave); there follows logically the impossibility of discerning such concurrent stimuli coinstantaneously. For we must suppose that the stimuli, when equal, tend alike to efface one another, since no one [form of stimulus] results from them; while, if they are unequal, the stronger alone is distinctly perceptible.

Again, the soul would be more likely to perceive coinstantaneously, with one and the same sensory act, two things in the same sensory province, such as the Grave and the Sharp in sound; for the sensory stimulation in this one province is more likely to be unitemporal than that involving two different provinces, as Sight and Hearing. But it is impossible to perceive two objects coinstantaneously in the same sensory act unless they have been mixed, [when, however, they are no longer two], for their amalgamation involves their becoming one, and the sensory act related to one object is itself one, and such act, when one, is, of course, coinstantaneous with itself. Hence, when things are mixed we of necessity perceive them coinstantaneously: for we perceive them by a perception actually one. For an object numerically one means that which is perceived by a perception actually one, whereas an object specifically one means that which is perceived by a sensory act potentially one [i.e. by an energeia of the same sensuous faculty]. If then the actualized perception is one, it will declare its data to be one object; they must, therefore, have been mixed.

Accordingly, when they have not been mixed, the actualized perceptions which perceive them will be two; but [if so, their perception must be successive not coinstantaneous, for] in one and the same faculty the perception actualized at any single moment is necessarily one, only one stimulation or exertion of a single faculty being possible at a single instant, and in the case supposed here the faculty is one. It follows, therefore, that we cannot conceive the possibility of perceiving two distinct objects coinstantaneously with one and the same sense.

But if it be thus impossible to perceive coinstantaneously two objects in the same province of sense if they are really two, manifestly it is still less conceivable that we should perceive coinstantaneously objects in two different sensory provinces, as White and Sweet. For it appears that when the Soul predicates numerical unity it does so in virtue of nothing else than such coinstantaneous perception [of one object, in one instant, by one energeia]: while it predicates specific unity in virtue of [the unity of] the discriminating faculty of sense together with [the unity of] the mode in which this operates. What I mean, for example, is this; the same sense no doubt discerns White and Black, [which are hence generically one] though specifically different from one another, and so, too, a faculty of sense self-identical, but different from the former, discerns Sweet and Bitter; but while both these faculties differ from one another [and each from itself] in their modes of discerning either of their respective contraries, yet in perceiving the co-ordinates in each province they proceed in manners analogous to one another; for instance, as Taste perceives Sweet, so Sight perceives White; and as the latter perceives Black, so the former perceives Bitter.

Again, if the stimuli of sense derived from Contraries are themselves Contrary, and if Contraries cannot be conceived as subsisting together in the same individual subject, and if

Contraries, e.g. Sweet and Bitter, come under one and the same sense-faculty, we must conclude that it is impossible to discern them coinstantaneously. It is likewise clearly impossible so to discern such homogeneous sensibles as are not [indeed] Contrary, [but are yet of different species]. For these are, [in the sphere of colour, for instance], classed some with White, others with Black, and so it is, likewise, in the other provinces of sense; for example, of savours, some are classed with Sweet, and others with Bitter. Nor can one discern the components in compounds coinstantaneously (for these are ratios of Contraries, as e.g. the Octave or the Fifth); unless, indeed, on condition of perceiving them as one. For thus, and not otherwise, the ratios of the extreme sounds are compounded into one ratio: since we should have together the ratio, on the one hand, of Many to Few or of Odd to Even, on the other, that of Few to Many or of Even to Odd [and these, to be perceived together, must be unified].

If, then, the sensibles denominated co-ordinates though in different provinces of sense (e.g. I call Sweet and White co-ordinates though in different provinces) stand yet more aloof, and differ more, from one another than do any sensibles in the same province; while Sweet differs from White even more than Black does from White, it is still less conceivable that one should discern them [viz. sensibles in different sensory provinces whether co-ordinates or not] coinstantaneously than sensibles which are in the same province. Therefore, if coinstantaneous perception of the latter be impossible, that of the former is a fortiori impossible.

Some of the writers who treat of concords assert that the sounds combined in these do not reach us simultaneously, but only appear to do so, their real successiveness being unnoticed whenever the time it involves is [so small as to be] imperceptible. Is this true or not? One might perhaps, following

this up, go so far as to say that even the current opinion that one sees and hears coinstantaneously is due merely to the fact that the intervals of time [between the really successive perceptions of sight and hearing] escape observation. But this can scarcely be true, nor is it conceivable that any portion of time should be [absolutely] imperceptible, or that any should be absolutely unnoticeable; the truth being that it is possible to perceive every instant of time. [This is so]; because, if it is inconceivable that a person should, while perceiving himself or aught else in a continuous time, be at any instant unaware of his own existence; while, obviously, the assumption, that there is in the time-continuum a time so small as to be absolutely imperceptible, carries the implication that a person would, during such time, be unaware of his own existence, as well as of his seeing and perceiving; [this assumption must be false].

Again, if there is any magnitude, whether time or thing, absolutely imperceptible owing to its smallness, it follows that there would not be either a thing which one perceives, or a time in which one perceives it, unless in the sense that in some part of the given time he sees some part of the given thing. For [let there be a line ab, divided into two parts at g, and let this line represent a whole object and a corresponding whole time. Now,] if one sees the whole line, and perceives it during a time which forms one and the same continuum, only in the sense that he does so in some portion of this time, let us suppose the part gb, representing a time in which by supposition he was perceiving nothing, cut off from the whole. Well, then, he perceives in a certain part [viz. in the remainder] of the time, or perceives a part [viz. the remainder] of the line, after the fashion in which one sees the whole earth by seeing some given part of it, or walks in a year by walking in some given part of the year. But [by hypothesis] in the part bg he perceives nothing: therefore, in fact, he is said to perceive the whole object and during the whole time simply because he perceives [some part of the

object] in some part of the time ab. But the same argument holds also in the case of ag [the remainder, regarded in its turn as a whole]; for it will be found [on this theory of vacant times and imperceptible magnitudes] that one always perceives only in some part of a given whole time, and perceives only some part of a whole magnitude, and that it is impossible to perceive any [really] whole [object in a really whole time; a conclusion which is absurd, as it would logically annihilate the perception of both Objects and Time].

Therefore we must conclude that all magnitudes are perceptible, but their actual dimensions do not present themselves immediately in their presentation as objects. One sees the sun, or a four-cubit rod at a distance, as a magnitude, but their exact dimensions are not given in their visual presentation: nay, at times an object of sight appears indivisible, but [vision like other special senses, is fallible respecting 'common sensibles', e.g. magnitude, and] nothing that one sees is really indivisible. The reason of this has been previously explained. It is clear then, from the above arguments, that no portion of time is imperceptible.

But we must here return to the question proposed above for discussion, whether it is possible or impossible to perceive several objects coinstantaneously; by 'coinstantaneously' I mean perceiving the several objects in a time one and indivisible relatively to one another, i.e. indivisible in a sense consistent with its being all a continuum.

First, then, is it conceivable that one should perceive the different things coinstantaneously, but each with a different part of the Soul? Or [must we object] that, in the first place, to begin with the objects of one and the same sense, e.g. Sight, if we assume it [the Soul qua exercising Sight] to perceive one colour with one part, and another colour with a different part, it

will have a plurality of parts the same in species, [as they must be,] since the objects which it thus perceives fall within the same genus?

Should any one [to illustrate how the Soul might have in it two different parts specifically identical, each directed to a set of aistheta the same in genus with that to which the other is directed] urge that, as there are two eyes, so there may be in the Soul something analogous, [the reply is] that of the eyes, doubtless, some one organ is formed, and hence their actualization in perception is one; but if this is so in the Soul, then, in so far as what is formed of both [i.e. of any two specifically identical parts as assumed] is one, the true perceiving subject also will be one, [and the contradictory of the above hypothesis (of different parts of Soul remaining engaged in simultaneous perception with one sense) is what emerges from the analogy]; while if the two parts of Soul remain separate, the analogy of the eyes will fail, [for of these some one is really formed].

Furthermore, [on the supposition of the need of different parts of Soul, co-operating in each sense, to discern different objects coinstantaneously], the senses will be each at the same time one and many, as if we should say that they were each a set of diverse sciences; for neither will an 'activity' exist without its proper faculty, nor without activity will there be sensation.

But if the Soul does not, in the way suggested [i.e. with different parts of itself acting simultaneously], perceive in one and the same individual time sensibles of the same sense, a fortiori it is not thus that it perceives sensibles of different senses. For it is, as already stated, more conceivable that it should perceive a plurality of the former together in this way than a plurality of heterogeneous objects.

If then, as is the fact, the Soul with one part perceives Sweet, with another, White, either that which results from these is some one part, or else there is no such one resultant. But there must be such an one, inasmuch as the general faculty of sense-perception is one. What one object, then, does that one faculty [when perceiving an object, e.g. as both White and Sweet] perceive? [None]; for assuredly no one object arises by composition of these [heterogeneous objects, such as White and Sweet]. We must conclude, therefore, that there is, as has been stated before, some one faculty in the soul with which the latter perceives all its percepts, though it perceives each different genus of sensibles through a different organ.

May we not, then, conceive this faculty which perceives White and Sweet to be one qua indivisible [sc. qua combining its different simultaneous objects] in its actualization, but different, when it has become divisible [sc. qua distinguishing its different simultaneous objects] in its actualization?

Or is what occurs in the case of the perceiving Soul conceivably analogous to what holds true in that of the things themselves? For the same numerically one thing is white and sweet, and has many other qualities, [while its numerical oneness is not thereby prejudiced] if the fact is not that the qualities are really separable in the object from one another, but that the being of each quality is different [from that of every other]. In the same way therefore we must assume also, in the case of the Soul, that the faculty of perception in general is in itself numerically one and the same, but different [differentiated] in its being; different, that is to say, in genus as regards some of its objects, in species as regards others. Hence too, we may conclude that one can perceive [numerically different objects] coinstantaneously with a faculty which is numerically one and the same, but not the same in its relationship [sc. according as the objects to which it is directed are not the same].

That every sensible object is a magnitude, and that nothing which it is possible to perceive is indivisible, may be thus shown. The distance whence an object could not be seen is indeterminate, but that whence it is visible is determinate. We may say the same of the objects of Smelling and Hearing, and of all sensibles not discerned by actual contact. Now, there is, in the interval of distance, some extreme place, the last from which the object is invisible, and the first from which it is visible. This place, beyond which if the object be one cannot perceive it, while if the object be on the hither side one must perceive it, is, I presume, itself necessarily indivisible. Therefore, if any sensible object be indivisible, such object, if set in the said extreme place whence imperceptibility ends and perceptibility begins, will have to be both visible and invisible their objects, whether regarded in general or at the same time; but this is impossible.

This concludes our survey of the characteristics of the organs of Sense-perception and their objects, whether regarded in general or in relation to each organ. Of the remaining subjects, we must first consider that of memory and remembering.

On Memory and Reminiscence

translated by J. I. Beare

1

We have, in the next place, to treat of Memory and Remembering, considering its nature, its cause, and the part of the soul to which this experience, as well as that of Recollecting, belongs. For the persons who possess a retentive memory are not identical with those who excel in power of recollection; indeed, as a rule, slow people have a good memory, whereas those who are quick-witted and clever are better at recollecting.

We must first form a true conception of these objects of memory, a point on which mistakes are often made. Now to remember the future is not possible, but this is an object of opinion or expectation (and indeed there might be actually a science of expectation, like that of divination, in which some believe); nor is there memory of the present, but only sense-perception. For by the latter we know not the future, nor the past, but the present only. But memory relates to the past. No one would say that he remembers the present, when it is present, e.g. a given white object at the moment when he sees it; nor would one say that he remembers an object of scientific contemplation at the moment when he is actually contemplating it, and has it full before his mind; – of the former he would say only that he perceives it, of the latter only that he knows it. But when one has scientific knowledge, or perception, apart from the actualizations of the faculty concerned, he thus 'remembers' (that the angles of a triangle are together equal to two right angles); as to the former, that he learned it, or thought it out for himself, as to the latter, that he heard, or saw, it, or

had some such sensible experience of it. For whenever one exercises the faculty of remembering, he must say within himself, 'I formerly heard (or otherwise perceived) this,' or 'I formerly had this thought'.

Memory is, therefore, neither Perception nor Conception, but a state or affection of one of these, conditioned by lapse of time. As already observed, there is no such thing as memory of the present while present, for the present is object only of perception, and the future, of expectation, but the object of memory is the past. All memory, therefore, implies a time elapsed; consequently only those animals which perceive time remember, and the organ whereby they perceive time is also that whereby they remember.

The subject of 'presentation' has been already considered in our work On the Soul. Without a presentation intellectual activity is impossible. For there is in such activity an incidental affection identical with one also incidental in geometrical demonstrations. For in the latter case, though we do not for the purpose of the proof make any use of the fact that the quantity in the triangle (for example, which we have drawn) is determinate, we nevertheless draw it determinate in quantity. So likewise when one exerts the intellect (e.g. on the subject of first principles), although the object may not be quantitative, one envisages it as quantitative, though he thinks it in abstraction from quantity; while, on the other hand, if the object of the intellect is essentially of the class of things that are quantitative, but indeterminate, one envisages it as if it had determinate quantity, though subsequently, in thinking it, he abstracts from its determinateness. Why we cannot exercise the intellect on any object absolutely apart from the continuous, or apply it even to non-temporal things unless in connexion with time, is another question. Now, one must cognize magnitude and motion by means of the same faculty by which one

cognizes time (i.e. by that which is also the faculty of memory), and the presentation (involved in such cognition) is an affection of the sensus communis; whence this follows, viz. that the cognition of these objects (magnitude, motion time) is effected by the (said sensus communis, i.e. the) primary faculty of perception. Accordingly, memory (not merely of sensible, but) even of intellectual objects involves a presentation: hence we may conclude that it belongs to the faculty of intelligence only incidentally, while directly and essentially it belongs to the primary faculty of sense-perception.

Hence not only human beings and the beings which possess opinion or intelligence, but also certain other animals, possess memory. If memory were a function of (pure) intellect, it would not have been as it is an attribute of many of the lower animals, but probably, in that case, no mortal beings would have had memory; since, even as the case stands, it is not an attribute of them all, just because all have not the faculty of perceiving time. Whenever one actually remembers having seen or heard, or learned, something, he includes in this act (as we have already observed) the consciousness of 'formerly'; and the distinction of 'former' and 'latter' is a distinction in time.

Accordingly if asked, of which among the parts of the soul memory is a function, we reply: manifestly of that part to which 'presentation' appertains; and all objects capable of being presented (viz. aistheta) are immediately and properly objects of memory, while those (viz. noeta) which necessarily involve (but only involve) presentation are objects of memory incidentally.

One might ask how it is possible that though the affection (the presentation) alone is present, and the (related) fact absent, the latter – that which is not present – is remembered. (The question arises), because it is clear that we must conceive that which is generated through sense-perception in the sentient

soul, and in the part of the body which is its seat – viz. that affection the state whereof we call memory – to be some such thing as a picture. The process of movement (sensory stimulation) involved the act of perception stamps in, as it were, a sort of impression of the percept, just as persons do who make an impression with a seal. This explains why, in those who are strongly moved owing to passion, or time of life, no mnemonic impression is formed; just as no impression would be formed if the movement of the seal were to impinge on running water; while there are others in whom, owing to the receiving surface being frayed, as happens to (the stucco on) old (chamber) walls, or owing to the hardness of the receiving surface, the requisite impression is not implanted at all. Hence both very young and very old persons are defective in memory; they are in a state of flux, the former because of their growth, the latter, owing to their decay. In like manner, also, both those who are too quick and those who are too slow have bad memories. The former are too soft, the latter too hard (in the texture of their receiving organs), so that in the case of the former the presented image (though imprinted) does not remain in the soul, while on the latter it is not imprinted at all.

But then, if this truly describes what happens in the genesis of memory, (the question stated above arises:) when one remembers, is it this impressed affection that he remembers, or is it the objective thing from which this was derived? If the former, it would follow that we remember nothing which is absent; if the latter, how is it possible that, though perceiving directly only the impression, we remember that absent thing which we do not perceive? Granted that there is in us something like an impression or picture, why should the perception of the mere impression be memory of something else, instead of being related to this impression alone? For when one actually remembers, this impression is what he contemplates, and this is what he perceives. How then does he

remember what is not present? One might as well suppose it possible also to see or hear that which is not present. In reply, we suggest that this very thing is quite conceivable, nay, actually occurs in experience. A picture painted on a panel is at once a picture and a likeness: that is, while one and the same, it is both of these, although the 'being' of both is not the same, and one may contemplate it either as a picture, or as a likeness. Just in the same way we have to conceive that the mnemonic presentation within us is something which by itself is merely an object of contemplation, while, in-relation to something else, it is also a presentation of that other thing. In so far as it is regarded in itself, it is only an object of contemplation, or a presentation; but when considered as relative to something else, e.g. as its likeness, it is also a mnemonic token. Hence, whenever the residual sensory process implied by it is actualized in consciousness, if the soul perceives this in so far as it is something absolute, it appears to occur as a mere thought or presentation; but if the soul perceives it qua related to something else, then, - just as when one contemplates the painting in the picture as being a likeness, and without having (at the moment) seen the actual Koriskos, contemplates it as a likeness of Koriskos, and in that case the experience involved in this contemplation of it (as relative) is different from what one has when he contemplates it simply as a painted figure – (so in the case of memory we have the analogous difference for), of the objects in the soul, the one (the unrelated object) presents itself simply as a thought, but the other (the related object) just because, as in the painting, it is a likeness, presents itself as a mnemonic token.

We can now understand why it is that sometimes, when we have such processes, based on some former act of perception, occurring in the soul, we do not know whether this really implies our having had perceptions corresponding to them, and we doubt whether the case is or is not one of memory. But

occasionally it happens that (while thus doubting) we get a sudden idea and recollect that we heard or saw something formerly. This (occurrence of the 'sudden idea') happens whenever, from contemplating a mental object as absolute, one changes his point of view, and regards it as relative to something else.

The opposite (sc. to the case of those who at first do not recognize their phantasms as mnemonic) also occurs, as happened in the cases of Antipheron of Oreus and others suffering from mental derangement; for they were accustomed to speak of their mere phantasms as facts of their past experience, and as if remembering them. This takes place whenever one contemplates what is not a likeness as if it were a likeness.

Mnemonic exercises aim at preserving one's memory of something by repeatedly reminding him of it; which implies nothing else (on the learner's part) than the frequent contemplation of something (viz. the 'mnemonic', whatever it may be) as a likeness, and not as out of relation.

As regards the question, therefore, what memory or remembering is, it has now been shown that it is the state of a presentation, related as a likeness to that of which it is a presentation; and as to the question of which of the faculties within us memory is a function, (it has been shown) that it is a function of the primary faculty of sense-perception, i.e. of that faculty whereby we perceive time.

2

Next comes the subject of Recollection, in dealing with which we must assume as fundamental the truths elicited above in our introductory discussions. For recollection is not the 'recovery' or 'acquisition' of memory; since at the instant when one at first learns (a fact of science) or experiences (a particular fact of sense), he does not thereby 'recover' a memory, inasmuch as none has preceded, nor does he acquire one ab initio. It is only at the instant when the aforesaid state or affection (of the aisthesis or upolepsis) is implanted in the soul that memory exists, and therefore memory is not itself implanted concurrently with the continuous implantation of the (original) sensory experience.

Further: at the very individual and concluding instant when first (the sensory experience or scientific knowledge) has been completely implanted, there is then already established in the person affected the (sensory) affection, or the scientific knowledge (if one ought to apply the term 'scientific knowledge' to the (mnemonic) state or affection; and indeed one may well remember, in the 'incidental' sense, some of the things (i.e. ta katholou) which are properly objects of scientific knowledge); but to remember, strictly and properly speaking, is an activity which will not be immanent until the original experience has undergone lapse of time. For one remembers now what one saw or otherwise experienced formerly; the moment of the original experience and the moment of the memory of it are never identical.

Again, (even when time has elapsed, and one can be said really to have acquired memory, this is not necessarily recollection, for firstly) it is obviously possible, without any present act of recollection, to remember as a continued consequence of the original perception or other experience; whereas when (after an

interval of obliviscence) one recovers some scientific knowledge which he had before, or some perception, or some other experience, the state of which we above declared to be memory, it is then, and then only, that this recovery may amount to a recollection of any of the things aforesaid. But, (though as observed above, remembering does not necessarily imply recollecting), recollecting always implies remembering, and actualized memory follows (upon the successful act of recollecting).

But secondly, even the assertion that recollection is the reinstatement in consciousness of something which was there before but had disappeared requires qualification. This assertion may be true, but it may also be false; for the same person may twice learn (from some teacher), or twice discover (i.e. excogitate), the same fact. Accordingly, the act of recollecting ought (in its definition) to be distinguished from these acts; i.e. recollecting must imply in those who recollect the presence of some spring over and above that from which they originally learn.

Acts of recollection, as they occur in experience, are due to the fact that one movement has by nature another that succeeds it in regular order.

If this order be necessary, whenever a subject experiences the former of two movements thus connected, it will (invariably) experience the latter; if, however, the order be not necessary, but customary, only in the majority of cases will the subject experience the latter of the two movements. But it is a fact that there are some movements, by a single experience of which persons take the impress of custom more deeply than they do by experiencing others many times; hence upon seeing some things but once we remember them better than others which we may have been frequently.

Whenever therefore, we are recollecting, we are experiencing certain of the antecedent movements until finally we experience the one after which customarily comes that which we seek. This explains why we hunt up the series (of kineseis) having started in thought either from a present intuition or some other, and from something either similar, or contrary, to what we seek, or else from that which is contiguous with it. Such is the empirical ground of the process of recollection; for the mnemonic movements involved in these starting-points are in some cases identical, in others, again, simultaneous, with those of the idea we seek, while in others they comprise a portion of them, so that the remnant which one experienced after that portion (and which still requires to be excited in memory) is comparatively small.

Thus, then, it is that persons seek to recollect, and thus, too, it is that they recollect even without the effort of seeking to do so, viz. when the movement implied in recollection has supervened on some other which is its condition. For, as a rule, it is when antecedent movements of the classes here described have first been excited, that the particular movement implied in recollection follows. We need not examine a series of which the beginning and end lie far apart, in order to see how (by recollection) we remember; one in which they lie near one another will serve equally well. For it is clear that the method is in each case the same, that is, one hunts up the objective series, without any previous search or previous recollection. For (there is, besides the natural order, viz. the order of the pralmata, or events of the primary experience, also a customary order, and) by the effect of custom the mnemonic movements tend to succeed one another in a certain order. Accordingly, therefore, when one wishes to recollect, this is what he will do: he will try to obtain a beginning of movement whose sequel shall be the movement which he desires to reawaken. This explains why attempts at recollection succeed soonest and best when they

start from a beginning (of some objective series). For, in order of succession, the mnemonic movements are to one another as the objective facts (from which they are derived). Accordingly, things arranged in a fixed order, like the successive demonstrations in geometry, are easy to remember (or recollect) while badly arranged subjects are remembered with difficulty.

Recollecting differs also in this respect from relearning, that one who recollects will be able, somehow, to move, solely by his own effort, to the term next after the starting-point. When one cannot do this of himself, but only by external assistance, he no longer remembers (i.e. he has totally forgotten, and therefore of course cannot recollect). It often happens that, though a person cannot recollect at the moment, yet by seeking he can do so, and discovers what he seeks. This he succeeds in doing by setting up many movements, until finally he excites one of a kind which will have for its sequel the fact he wishes to recollect. For remembering (which is the condicio sine qua non of recollecting) is the existence, potentially, in the mind of a movement capable of stimulating it to the desired movement, and this, as has been said, in such a way that the person should be moved (prompted to recollection) from within himself, i.e. in consequence of movements wholly contained within himself.

But one must get hold of a starting-point. This explains why it is that persons are supposed to recollect sometimes by starting from mnemonic loci. The cause is that they pass swiftly in thought from one point to another, e.g. from milk to white, from white to mist, and thence to moist, from which one remembers Autumn (the 'season of mists'), if this be the season he is trying to recollect.

It seems true in general that the middle point also among all things is a good mnemonic starting-point from which to reach any of them. For if one does not recollect before, he will do so

when he has come to this, or, if not, nothing can help him; as, e.g. if one were to have in mind the numerical series denoted by the symbols A, B, G, D, E, Z, I, H, O. For, if he does not remember what he wants at E, then at E he remembers O; because from E movement in either direction is possible, to D or to Z. But, if it is not for one of these that he is searching, he will remember (what he is searching for) when he has come to G if he is searching for H or I. But if (it is) not (for H or I that he is searching, but for one of the terms that remain), he will remember by going to A, and so in all cases (in which one starts from a middle point). The cause of one's sometimes recollecting and sometimes not, though starting from the same point, is, that from the same starting-point a movement can be made in several directions, as, for instance, from G to I or to D. If, then, the mind has not (when starting from E) moved in an old path (i.e. one in which it moved first having the objective experience, and that, therefore, in which un-'ethized' phusis would have it again move), it tends to move to the more customary; for (the mind having, by chance or otherwise, missed moving in the 'old' way) Custom now assumes the role of Nature. Hence the rapidity with which we recollect what we frequently think about. For as regular sequence of events is in accordance with nature, so, too, regular sequence is observed in the actualization of kinesis (in consciousness), and here frequency tends to produce (the regularity of) nature. And since in the realm of nature occurrences take place which are even contrary to nature, or fortuitous, the same happens a fortiori in the sphere swayed by custom, since in this sphere natural law is not similarly established. Hence it is that (from the same starting-point) the mind receives an impulse to move sometimes in the required direction, and at other times otherwise, (doing the latter) particularly when something else somehow deflects the mind from the right direction and attracts it to itself. This last consideration explains too how it happens that, when we want

to remember a name, we remember one somewhat like it, indeed, but blunder in reference to (i.e. in pronouncing) the one we intended.

Thus, then, recollection takes place.

But the point of capital importance is that (for the purpose of recollection) one should cognize, determinately or indeterminately, the time-relation (of that which he wishes to recollect). There is, let it be taken as a fact, something by which one distinguishes a greater and a smaller time; and it is reasonable to think that one does this in a way analogous to that in which one discerns (spacial) magnitudes. For it is not by the mind's reaching out towards them, as some say a visual ray from the eye does (in seeing), that one thinks of large things at a distance in space (for even if they are not there, one may similarly think them); but one does so by a proportionate mental movement. For there are in the mind the like figures and movements (i.e. 'like' to those of objects and events). Therefore, when one thinks the greater objects, in what will his thinking those differ from his thinking the smaller? (In nothing,) because all the internal though smaller are as it were proportional to the external. Now, as we may assume within a person something proportional to the forms (of distant magnitudes), so, too, we may doubtless assume also something else proportional to their distances. As, therefore, if one has (psychically) the movement in AB, BE, he constructs in thought (i.e. knows objectively) GD, since AG and GD bear equal ratios respectively (to AB and BE), (so he who recollects also proceeds). Why then does he construct GD rather than ZH? Is it not because as AG is to AB, so is O to I? These movements therefore (sc. in AB, BE, and in O:I) he has simultaneously. But if he wishes to construct to thought ZH, he has in mind BE in like manner as before (when constructing GD), but now, instead of (the

movements of the ratio) O:I, he has in mind (those of the ratio K:L; for K:L::ZA:BA. (See diagram.)

When, therefore, the ‘movement’ corresponding to the object and that corresponding to its time concur, then one actually remembers. If one supposes (himself to move in these different but concurrent ways) without really doing so, he supposes himself to remember.

For one may be mistaken, and think that he remembers when he really does not. But it is not possible, conversely, that when one actually remembers he should not suppose himself to remember, but should remember unconsciously. For remembering, as we have conceived it, essentially implies consciousness of itself. If, however, the movement corresponding to the objective fact takes place without that corresponding to the time, or, if the latter takes place without the former, one does not remember.

The movement answering to the time is of two kinds. Sometimes in remembering a fact one has no determinate time-notion of it, no such notion as that e.g. he did something or other on the day before yesterday; while in other cases he has a determinate notion of the time. Still, even though one does not remember with actual determination of the time, he genuinely remembers, none the less. Persons are wont to say that they remember (something), but yet do not know when (it occurred, as happens) whenever they do not know determinately the exact length of time implied in the ‘when’.

It has been already stated that those who have a good memory are not identical with those who are quick at recollecting. But the act of recollecting differs from that of remembering, not only chronologically, but also in this, that many also of the other animals (as well as man) have memory, but, of all that we are acquainted with, none, we venture to say, except man, shares in

the faculty of recollection. The cause of this is that recollection is, as it were a mode of inference. For he who endeavours to recollect infers that he formerly saw, or heard, or had some such experience, and the process (by which he succeeds in recollecting) is, as it were, a sort of investigation. But to investigate in this way belongs naturally to those animals alone which are also endowed with the faculty of deliberation; (which proves what was said above), for deliberation is a form of inference.

That the affection is corporeal, i.e. that recollection is a searching for an 'image' in a corporeal substrate, is proved by the fact that in some persons, when, despite the most strenuous application of thought, they have been unable to recollect, it (viz. the anamnesis = the effort at recollection) excites a feeling of discomfort, which, even though they abandon the effort at recollection, persists in them none the less; and especially in persons of melancholic temperament. For these are most powerfully moved by presentations. The reason why the effort of recollection is not under the control of their will is that, as those who throw a stone cannot stop it at their will when thrown, so he who tries to recollect and 'hunts' (after an idea) sets up a process in a material part, (that) in which resides the affection. Those who have moisture around that part which is the centre of sense-perception suffer most discomfort of this kind. For when once the moisture has been set in motion it is not easily brought to rest, until the idea which was sought for has again presented itself, and thus the movement has found a straight course. For a similar reason bursts of anger or fits of terror, when once they have excited such motions, are not at once allayed, even though the angry or terrified persons (by efforts of will) set up counter motions, but the passions continue to move them on, in the same direction as at first, in opposition to such counter motions. The affection resembles also that in the case of words, tunes, or sayings, whenever one

of them has become inveterate on the lips. People give them up and resolve to avoid them; yet again they find themselves humming the forbidden air, or using the prohibited word. Those whose upper parts are abnormally large, as. is the case with dwarfs, have abnormally weak memory, as compared with their opposites, because of the great weight which they have resting upon the organ of perception, and because their mnemonic movements are, from the very first, not able to keep true to a course, but are dispersed, and because, in the effort at recollection, these movements do not easily find a direct onward path. Infants and very old persons have bad memories, owing to the amount of movement going on within them; for the latter are in process of rapid decay, the former in process of vigorous growth; and we may add that children, until considerably advanced in years, are dwarf-like in their bodily structure. Such then is our theory as regards memory and remembering their nature, and the particular organ of the soul by which animals remember; also as regards recollection, its formal definition, and the manner and causes of its performance.

On Sleep And Sleeplessness

translated by J. I. Beare

1

With regard to sleep and waking, we must consider what they are: whether they are peculiar to soul or to body, or common to both; and if common, to what part of soul or body they appertain: further, from what cause it arises that they are attributes of animals, and whether all animals share in them both, or some partake of the one only, others of the other only, or some partake of neither and some of both.

Further, in addition to these questions, we must also inquire what the dream is, and from what cause sleepers sometimes dream, and sometimes do not; or whether the truth is that sleepers always dream but do not always remember (their dream); and if this occurs, what its explanation is.

Again, [we must inquire] whether it is possible or not to foresee the future (in dreams), and if it be possible, in what manner; further, whether, supposing it possible, it extends only to things to be accomplished by the agency of Man, or to those also of which the cause lies in supra-human agency, and which result from the workings of Nature, or of Spontaneity.

First, then, this much is clear, that waking and sleep appertain to the same part of an animal, inasmuch as they are opposites, and sleep is evidently a privation of waking. For contraries, in natural as well as in all other matters, are seen always to present themselves in the same subject, and to be affections of the same: examples are – health and sickness, beauty and

ugliness, strength and weakness, sight and blindness, hearing and deafness. This is also clear from the following considerations. The criterion by which we know the waking person to be awake is identical with that by which we know the sleeper to be asleep; for we assume that one who is exercising sense-perception is awake, and that every one who is awake perceives either some external movement or else some movement in his own consciousness. If waking, then, consists in nothing else than the exercise of sense-perception, the inference is clear, that the organ, in virtue of which animals perceive, is that by which they wake, when they are awake, or sleep, when they are awake, or sleep, when they are asleep.

But since the exercise of sense-perception does not belong to soul or body exclusively, then (since the subject of actuality is in every case identical with that of potentiality, and what is called sense-perception, as actuality, is a movement of the soul through the body) it is clear that its affection is not an affection of soul exclusively, and that a soulless body has not the potentiality of perception. [Thus sleep and waking are not attributes of pure intelligence, on the one hand, or of inanimate bodies, on the other.]

Now, whereas we have already elsewhere distinguished what are called the parts of the soul, and whereas the nutrient is, in all living bodies, capable of existing without the other parts, while none of the others can exist without the nutrient; it is clear that sleep and waking are not affections of such living things as partake only of growth and decay, e.g. not of plants, because these have not the faculty of sense-perception, whether or not this be capable of separate existence; in its potentiality, indeed, and in its relationships, it is separable.

Likewise it is clear that [of those which either sleep or wake] there is no animal which is always awake or always asleep, but

that both these affections belong [alternately] to the same animals. For if there be an animal not endued with sense-perception, it is impossible that this should either sleep or wake; since both these are affections of the activity of the primary faculty of sense-perception. But it is equally impossible also that either of these two affections should perpetually attach itself to the same animal, e.g. that some species of animal should be always asleep or always awake, without intermission; for all organs which have a natural function must lose power when they work beyond the natural time-limit of their working period; for instance, the eyes [must lose power] from [too long continued] seeing, and must give it up; and so it is with the hand and every other member which has a function. Now, if sense-perception is the function of a special organ, this also, if it continues perceiving beyond the appointed time-limit of its continuous working period, will lose its power, and will do its work no longer. Accordingly, if the waking period is determined by this fact, that in it sense-perception is free; if in the case of some contraries one of the two must be present, while in the case of others this is not necessary; if waking is the contrary of sleeping, and one of these two must be present to every animal: it must follow that the state of sleeping is necessary. Finally, if such affection is Sleep, and this is a state of powerlessness arising from excess of waking, and excess of waking is in its origin sometimes morbid, sometimes not, so that the powerlessness or dissolution of activity will be so or not; it is inevitable that every creature which wakes must also be capable of sleeping, since it is impossible that it should continue actualizing its powers perpetually.

So, also, it is impossible for any animal to continue always sleeping. For sleep is an affection of the organ of sense-perception – a sort of tie or inhibition of function imposed on it, so that every creature that sleeps must needs have the organ of sense-perception. Now, that alone which is capable of sense-

perception in actuality has the faculty of sense-perception; but to realize this faculty, in the proper and unqualified sense, is impossible while one is asleep. All sleep, therefore, must be susceptible of awakening. Accordingly, almost all other animals are clearly observed to partake in sleep, whether they are aquatic, aerial, or terrestrial, since fishes of all kinds, and molluscs, as well as all others which have eyes, have been seen sleeping. 'Hard-eyed' creatures and insects manifestly assume the posture of sleep; but the sleep of all such creatures is of brief duration, so that often it might well baffle one's observation to decide whether they sleep or not. Of testaceous animals, on the contrary, no direct sensible evidence is as yet forthcoming to determine whether they sleep, but if the above reasoning be convincing to any one, he who follows it will admit this [viz. that they do so.]

That, therefore, all animals sleep may be gathered from these considerations. For an animal is defined as such by its possessing sense-perception; and we assert that sleep is, in a certain way, an inhibition of function, or, as it were, a tie, imposed on sense-perception, while its loosening or remission constitutes the being awake. But no plant can partake in either of these affections, for without sense-perception there is neither sleeping nor waking. But creatures which have sense-perception have likewise the feeling of pain and pleasure, while those which have these have appetite as well; but plants have none of these affections. A mark of this is that the nutrient part does its own work better when (the animal) is asleep than when it is awake. Nutrition and growth are then especially promoted, a fact which implies that creatures do not need sense-perception to assist these processes.

2

We must now proceed to inquire into the cause why one sleeps and wakes, and into the particular nature of the sense-perception, or sense-perceptions, if there be several, on which these affections depend. Since, then, some animals possess all the modes of sense-perception, and some not all, not, for example, sight, while all possess touch and taste, except such animals as are imperfectly developed, a class of which we have already treated in our work on the soul; and since an animal when asleep is unable to exercise, in the simple sense any particular sensory faculty whatever, it follows that in the state called sleep the same affection must extend to all the special senses; because, if it attaches itself to one of them but not to another, then an animal while asleep may perceive with the latter; but this is impossible.

Now, since every sense has something peculiar, and also something common; peculiar, as, e.g. seeing is to the sense of sight, hearing to the auditory sense, and so on with the other senses severally; while all are accompanied by a common power, in virtue whereof a person perceives that he sees or hears (for, assuredly, it is not by the special sense of sight that one sees that he sees; and it is not by mere taste, or sight, or both together that one discerns, and has the faculty of discerning, that sweet things are different from white things, but by a faculty connected in common with all the organs of sense; for there is one sensory function, and the controlling sensory faculty is one, though differing as a faculty of perception in relation to each genus of sensibles, e.g. sound or colour); and since this [common sensory activity] subsists in association chiefly with the faculty of touch (for this can exist apart from all the other organs of sense, but none of them can exist apart from it – a subject of which we have treated in our speculations concerning the Soul); it is therefore evident that

waking and sleeping are an affection of this [common and controlling organ of sense-perception]. This explains why they belong to all animals, for touch [with which this common organ is chiefly connected], alone, [is common] to all [animals].

For if sleeping were caused by the special senses having each and all undergone some affection, it would be strange that these senses, for which it is neither necessary nor in a manner possible to realize their powers simultaneously, should necessarily all go idle and become motionless simultaneously. For the contrary experience, viz. that they should not go to rest altogether, would have been more reasonably anticipated. But, according to the explanation just given, all is quite clear regarding those also. For, when the sense organ which controls all the others, and to which all the others are tributary, has been in some way affected, that these others should be all affected at the same time is inevitable, whereas, if one of the tributaries becomes powerless, that the controlling organ should also become powerless need in no wise follow.

It is indeed evident from many considerations that sleep does not consist in the mere fact that the special senses do not function or that one does not employ them; and that it does not consist merely in an inability to exercise the sense-perceptions; for such is what happens in cases of swooning. A swoon means just such impotence of perception, and certain other cases of unconsciousness also are of this nature. Moreover, persons who have the bloodvessels in the neck compressed become insensible. But sleep supervenes when such incapacity of exercise has neither arisen in some casual organ of sense, nor from some chance cause, but when, as has been just stated, it has its seat in the primary organ with which one perceives objects in general. For when this has become powerless all the other sensory organs also must lack power to perceive; but

when one of them has become powerless, it is not necessary for this also to lose its power.

We must next state the cause to which it is due, and its quality as an affection. Now, since there are several types of cause (for we assign equally the 'final', the 'efficient', the 'material', and the 'formal' as causes), in the first place, then, as we assert that Nature operates for the sake of an end, and that this end is a good; and that to every creature which is endowed by nature with the power to move, but cannot with pleasure to itself move always and continuously, rest is necessary and beneficial; and since, taught by experience, men apply to sleep this metaphorical term, calling it a 'rest' [from the strain of movement implied in sense-perception]: we conclude that its end is the conservation of animals. But the waking state is for an animal its highest end, since the exercise of sense-perception or of thought is the highest end for all beings to which either of these appertains; inasmuch as these are best, and the highest end is what is best: whence it follows that sleep belongs of necessity to each animal. I use the term 'necessity' in its conditional sense, meaning that if an animal is to exist and have its own proper nature, it must have certain endowments; and, if these are to belong to it, certain others likewise must belong to it [as their condition.]

The next question to be discussed is that of the kind of movement or action, taking place within their bodies, from which the affection of waking or sleeping arises in animals. Now, we must assume that the causes of this affection in all other animals are identical with, or analogous to, those which operate in sanguineous animals; and that the causes operating in sanguineous animals generally are identical with those operating in man. Hence we must consider the entire subject in the light of these instances [afforded by sanguineous animals, especially man]. Now, it has been definitely settled already in

another work that sense-perception in animals originates ill the same part of the organism in which movement originates. This locus of origination is one of three determinate loci, viz. that which lies midway between the head and the abdomen. This is sanguineous animals is the region of the heart; for all sanguineous animals have a heart; and from this it is that both motion and the controlling sense-perception originate. Now, as regards movement, it is obvious that that of breathing and of the cooling process generally takes its rise there; and it is with a view to the conservation of the [due amount of] heat in this part that nature has formed as she has both the animals which respire, and those which cool themselves by moisture. Of this [cooling process] per se we shall treat hereafter. In bloodless animals, and insects, and such as do not respire, the 'connatural spirit' is seen alternately puffed up and subsiding in the part which is in them analogous [to the region of the heart in sanguineous animals]. This is clearly observable in the holoptera [insects with undivided wings] as wasps and bees; also in flies and such creatures. And since to move anything, or do anything, is impossible without strength, and holding the breath produces strength – in creatures which inhale, the holding of that breath which comes from without, but, in creatures which do not respire, of that which is connatural (which explains why winged insects of the class holoptera, when they move, are perceived to make a humming noise, due to the friction of the connatural spirit colliding with the diaphragm); and since movement is, in every animal, attended with some sense-perception, either internal or external, in the primary organ of sense, [we conclude] accordingly that if sleeping and waking are affections of this organ, the place in which, or the organ in which, sleep and waking originate, is self-evident [being that in which movement and sense-perception originate, viz. the heart].

Some persons move in their sleep, and perform many acts like waking acts, but not without a phantasm or an exercise of sense-perception; for a dream is in a certain way a sense-impression. But of them we have to speak later on. Why it is that persons when aroused remember their dreams, but do not remember these acts which are like waking acts, has been already explained in the work 'Of Problems'.

3

The point for consideration next in order to the preceding is: – What are the processes in which the affection of waking and sleeping originates, and whence do they arise? Now, since it is when it has sense-perception that an animal must first take food and receive growth, and in all cases food in its ultimate form is, in sanguineous animals, the natural substance blood, or, in bloodless animals, that which is analogous to this; and since the veins are the place of the blood, while the origin of these is the heart – an assertion which is proved by anatomy – it is manifest that, when the external nutriment enters the parts fitted for its reception, the evaporation arising from it enters into the veins, and there, undergoing a change, is converted into blood, and makes its way to their source [the heart]. We have treated of all this when discussing the subject of nutrition, but must here recapitulate what was there said, in order that we may obtain a scientific view of the beginnings of the process, and come to know what exactly happens to the primary organ of sense-perception to account for the occurrence of waking and sleep. For sleep, as has been shown, is not any given impotence of the perceptive faculty; for unconsciousness, a certain form of asphyxia, and swooning, all produce such impotence. Moreover it is an established fact that some persons

in a profound trance have still had the imaginative faculty in play. This last point, indeed, gives rise to a difficulty; for if it is conceivable that one who had swooned should in this state fall asleep, the phantasm also which then presented itself to his mind might be regarded as a dream. Persons, too, who have fallen into a deep trance, and have come to be regarded as dead, say many things while in this condition. The same view, however, is to be taken of all these cases, [i.e. that they are not cases of sleeping or dreaming].

As we observed above, sleep is not co-extensive with any and every impotence of the perceptive faculty, but this affection is one which arises from the evaporation attendant upon the process of nutrition. The matter evaporated must be driven onwards to a certain point, then turn back, and change its current to and fro, like a tide-race in a narrow strait. Now, in every animal the hot naturally tends to move [and carry other things] upwards, but when it has reached the parts above [becoming cool], it turns back again, and moves downwards in a mass. This explains why fits of drowsiness are especially apt to come on after meals; for the matter, both the liquid and the corporeal, which is borne upwards in a mass, is then of considerable quantity. When, therefore, this comes to a stand it weighs a person down and causes him to nod, but when it has actually sunk downwards, and by its return has repulsed the hot, sleep comes on, and the animal so affected is presently asleep. A confirmation of this appears from considering the things which induce sleep; they all, whether potable or edible, for instance poppy, mandragora, wine, darnel, produce a heaviness in the head; and persons borne down [by sleepiness] and nodding [drowsily] all seem affected in this way, i.e. they are unable to lift up the head or the eye-lids. And it is after meals especially that sleep comes on like this, for the evaporation from the foods eaten is then copious. It also follows certain forms of fatigue; for fatigue operates as a solvent, and

the dissolved matter acts, if not cold, like food prior to digestion. Moreover, some kinds of illness have this same effect; those arising from moist and hot secretions, as happens with fever-patients and in cases of lethargy. Extreme youth also has this effect; infants, for example, sleep a great deal, because of the food being all borne upwards – a mark whereof appears in the disproportionately large size of the upper parts compared with the lower during infancy, which is due to the fact that growth predominates in the direction of the former. Hence also they are subject to epileptic seizures; for sleep is like epilepsy, and, in a sense, actually is a seizure of this sort. Accordingly, the beginning of this malady takes place with many during sleep, and their subsequent habitual seizures occur in sleep, not in waking hours. For when the spirit [evaporation] moves upwards in a volume, on its return downwards it distends the veins, and forcibly compresses the passage through which respiration is effected. This explains why wines are not good for infants or for wet nurses (for it makes no difference, doubtless, whether the infants themselves, or their nurses, drink them), but such persons should drink them [if at all] diluted with water and in small quantity. For wine is spirituous, and of all wines the dark more so than any other. The upper parts, in infants, are so filled with nutriment that within five months [after birth] they do not even turn the neck [sc. to raise the head]; for in them, as in persons deeply intoxicated, there is ever a large quantity of moisture ascending. It is reasonable, too, to think that this affection is the cause of the embryo's remaining at rest in the womb at first. Also, as a general rule, persons whose veins are inconspicuous, as well as those who are dwarf-like, or have abnormally large heads, are addicted to sleep. For in the former the veins are narrow, so that it is not easy for the moisture to flow down through them; while in the case of dwarfs and those whose heads are abnormally large, the impetus of the evaporation upwards is excessive. Those [on the contrary]

whose veins are large are, thanks to the easy flow through the veins, not addicted to sleep, unless, indeed, they labour under some other affection which counteracts [this easy flow]. Nor are the 'atrabilious' addicted to sleep, for in them the inward region is cooled so that the quantity of evaporation in their case is not great. For this reason they have large appetites, though spare and lean; for their bodily condition is as if they derived no benefit from what they eat. The dark bile, too, being itself naturally cold, cools also the nutrient tract, and the other parts wheresoever such secretion is potentially present [i.e. tends to be formed].

Hence it is plain from what has been said that sleep is a sort of concentration, or natural recoil, of the hot matter inwards [towards its centre], due to the cause above mentioned. Hence restless movement is a marked feature in the case of a person when drowsy. But where it [the heat in the upper and outer parts] begins to fail, he grows cool, and owing to this cooling process his eye-lids droop. Accordingly [in sleep] the upper and outward parts are cool, but the inward and lower, i.e. the parts at the feet and in the interior of the body, are hot.

Yet one might found a difficulty on the facts that sleep is most oppressive in its onset after meals, and that wine, and other such things, though they possess heating properties, are productive of sleep, for it is not probable that sleep should be a process of cooling while the things that cause sleeping are themselves hot. Is the explanation of this, then, to be found in the fact that, as the stomach when empty is hot, while replenishment cools it by the movement it occasions, so the passages and tracts in the head are cooled as the 'evaporation' ascends thither? Or, as those who have hot water poured on them feel a sudden shiver of cold, just so in the case before us, may it be that, when the hot substance ascends, the cold rallying to meet it cools [the aforesaid parts] deprives their

native heat of all its power, and compels it to retire? Moreover, when much food is taken, which [i.e. the nutrient evaporation from which] the hot substance carries upwards, this latter, like a fire when fresh logs are laid upon it, is itself cooled, until the food has been digested.

For, as has been observed elsewhere, sleep comes on when the corporeal element [in the 'evaporation'] conveyed upwards by the hot, along the veins, to the head. But when that which has been thus carried up can no longer ascend, but is too great in quantity [to do so], it forces the hot back again and flows downwards. Hence it is that men sink down [as they do in sleep] when the heat which tends to keep them erect (man alone, among animals, being naturally erect) is withdrawn; and this, when it befalls them, causes unconsciousness, and afterwards phantasy.

Or are the solutions thus proposed barely conceivable accounts of the refrigeration which takes place, while, as a matter of fact, the region of the brain is, as stated elsewhere, the main determinant of the matter? For the brain, or in creatures without a brain that which corresponds to it, is of all parts of the body the coolest. Therefore, as moisture turned into vapour by the sun's heat is, when it has ascended to the upper regions, cooled by the coldness of the latter, and becoming condensed, is carried downwards, and turned into water once more; just so the excrementitious evaporation, when carried up by the heat to the region of the brain, is condensed into a 'phlegm' (which explains why catarrhs are seen to proceed from the head); while that evaporation which is nutrient and not unwholesome, becoming condensed, descends and cools the hot. The tenuity or narrowness of the veins about the brain itself contributes to its being kept cool, and to its not readily admitting the evaporation. This, then, is a sufficient explanation of the cooling

which takes place, despite the fact that the evaporation is exceedingly hot.

A person awakes from sleep when digestion is completed: when the heat, which had been previously forced together in large quantity within a small compass from out the surrounding part, has once more prevailed, and when a separation has been effected between the more corporeal and the purer blood. The finest and purest blood is that contained in the head, while the thickest and most turbid is that in the lower parts. The source of all the blood is, as has been stated both here and elsewhere, the heart. Now of the chambers in the heart the central communicates with each of the two others. Each of the latter again acts as receiver from each, respectively, of the two vessels, called the 'great' and the 'aorta'. It is in the central chamber that the [above-mentioned] separation takes place. To go into these matters in detail would, however, be more properly the business of a different treatise from the present. Owing to the fact that the blood formed after the assimilation of food is especially in need of separation, sleep [then especially] occurs [and lasts] until the purest part of this blood has been separated off into the upper parts of the body, and the most turbid into the lower parts. When this has taken place animals awake from sleep, being released from the heaviness consequent on taking food. We have now stated the cause of sleeping, viz. that it consists in the recoil by the corporeal element, upborne by the connatural heat, in a mass upon the primary sense-organ; we have also stated what sleep is, having shown that it is a seizure of the primary sense-organ, rendering it unable to actualize its powers; arising of necessity (for it is impossible for an animal to exist if the conditions which render it an animal be not fulfilled), i.e. for the sake of its conservation; since remission of movement tends to the conservation of animals.

On Dreams

translated by J. I. Beare

1

We must, in the next place, investigate the subject of the dream, and first inquire to which of the faculties of the soul it presents itself, i.e. whether the affection is one which pertains to the faculty of intelligence or to that of sense-perception; for these are the only faculties within us by which we acquire knowledge.

If, then, the exercise of the faculty of sight is actual seeing, that of the auditory faculty, hearing, and, in general that of the faculty of sense-perception, perceiving; and if there are some perceptions common to the senses, such as figure, magnitude, motion, &c., while there are others, as colour, sound, taste, peculiar [each to its own sense]; and further, if all creatures, when the eyes are closed in sleep, are unable to see, and the analogous statement is true of the other senses, so that manifestly we perceive nothing when asleep; we may conclude that it is not by sense-perception we perceive a dream.

But neither is it by opinion that we do so. For [in dreams] we not only assert, e.g. that some object approaching is a man or a horse [which would be an exercise of opinion], but that the object is white or beautiful, points on which opinion without sense-perception asserts nothing either truly or falsely. It is, however, a fact that the soul makes such assertions in sleep. We seem to see equally well that the approaching figure is a man,

and that it is white. [In dreams], too, we think something else, over and above the dream presentation, just as we do in waking moments when we perceive something; for we often also reason about that which we perceive. So, too, in sleep we sometimes have thoughts other than the mere phantasms immediately before our minds. This would be manifest to any one who should attend and try, immediately on arising from sleep, to remember [his dreaming experience]. There are cases of persons who have seen such dreams, those, for example, who believe themselves to be mentally arranging a given list of subjects according to the mnemonic rule. They frequently find themselves engaged in something else besides the dream, viz. in setting a phantasm which they envisage into its mnemonic position. Hence it is plain that not every 'phantasm' in sleep is a mere dream-image, and that the further thinking which we perform then is due to an exercise of the faculty of opinion.

So much at least is plain on all these points, viz. that the faculty by which, in waking hours, we are subject to illusion when affected by disease, is identical with that which produces illusory effects in sleep. So, even when persons are in excellent health, and know the facts of the case perfectly well, the sun, nevertheless, appears to them to be only a foot wide. Now, whether the presentative faculty of the soul be identical with, or different from, the faculty of sense-perception, in either case the illusion does not occur without our actually seeing or [otherwise] perceiving something. Even to see wrongly or to hear wrongly can happen only to one who sees or hears something real, though not exactly what he supposes. But we have assumed that in sleep one neither sees, nor hears, nor exercises any sense whatever. Perhaps we may regard it as true that the dreamer sees nothing, yet as false that his faculty of sense-perception is unaffected, the fact being that the sense of seeing and the other senses may possibly be then in a certain way affected, while each of these affections, as duly as when he

is awake, gives its impulse in a certain manner to his [primary] faculty of sense, though not in precisely the same manner as when he is awake. Sometimes, too, opinion says [to dreamers] just as to those who are awake, that the object seen is an illusion; at other times it is inhibited, and becomes a mere follower of the phantasm.

It is plain therefore that this affection, which we name ‘dreaming’, is no mere exercise of opinion or intelligence, but yet is not an affection of the faculty of perception in the simple sense. If it were the latter it would be possible [when asleep] to hear and see in the simple sense.

How then, and in what manner, it takes place, is what we have to examine. Let us assume, what is indeed clear enough, that the affection [of dreaming] pertains to sense-perception as surely as sleep itself does. For sleep does not pertain to one organ in animals and dreaming to another; both pertain to the same organ.

But since we have, in our work On the Soul, treated of presentation, and the faculty of presentation is identical with that of sense-perception, though the essential notion of a faculty of presentation is different from that of a faculty of sense-perception; and since presentation is the movement set up by a sensory faculty when actually discharging its function, while a dream appears to be a presentation (for a presentation which occurs in sleep – whether simply or in some particular way – is what we call a dream): it manifestly follows that dreaming is an activity of the faculty of sense-perception, but belongs to this faculty qua presentative.

2

We can best obtain a scientific view of the nature of the dream and the manner in which it originates by regarding it in the light of the circumstances attending sleep. The objects of sense-perception corresponding to each sensory organ produce sense-perception in us, and the affection due to their operation is present in the organs of sense not only when the perceptions are actualized, but even when they have departed.

What happens in these cases may be compared with what happens in the case of projectiles moving in space. For in the case of these the movement continues even when that which set up the movement is no longer in contact [with the things that are moved]. For that which set them in motion moves a certain portion of air, and this, in turn, being moved excites motion in another portion; and so, accordingly, it is in this way that [the bodies], whether in air or in liquids, continue moving, until they come to a standstill.

This we must likewise assume to happen in the case of qualitative change; for that part which [for example] has been heated by something hot, heats [in turn] the part next to it, and this propagates the affection continuously onwards until the process has come round to its oint of origination. This must also happen in the organ wherein the exercise of sense-perception takes place, since sense-perception, as realized in actual perceiving, is a mode of qualitative change. This explains why the affection continues in the sensory organs, both in their deeper and in their more superficial parts, not merely while they are actually engaged in perceiving, but even after they have ceased to do so. That they do this, indeed, is obvious in cases where we continue for some time engaged in a particular form of perception, for then, when we shift the scene of our perceptive activity, the previous affection remains; for instance,

when we have turned our gaze from sunlight into darkness. For the result of this is that one sees nothing, owing to the excited by the light still subsisting in our eyes. Also, when we have looked steadily for a long while at one colour, e.g. at white or green, that to which we next transfer our gaze appears to be of the same colour. Again if, after having looked at the sun or some other brilliant object, we close the eyes, then, if we watch carefully, it appears in a right line with the direction of vision (whatever this may be), at first in its own colour; then it changes to crimson, next to purple, until it becomes black and disappears. And also when persons turn away from looking at objects in motion, e.g. rivers, and especially those which flow very rapidly, they find that the visual stimulations still present themselves, for the things really at rest are then seen moving: persons become very deaf after hearing loud noises, and after smelling very strong odours their power of smelling is impaired; and similarly in other cases. These phenomena manifestly take place in the way above described.

That the sensory organs are acutely sensitive to even a slight qualitative difference [in their objects] is shown by what happens in the case of mirrors; a subject to which, even taking it independently, one might devote close consideration and inquiry. At the same time it becomes plain from them that as the eye [in seeing] is affected [by the object seen], so also it produces a certain effect upon it. If a woman chances during her menstrual period to look into a highly polished mirror, the surface of it will grow cloudy with a blood-coloured haze. It is very hard to remove this stain from a new mirror, but easier to remove from an older mirror. As we have said before, the cause of this lies in the fact that in the act of sight there occurs not only a passion in the sense organ acted on by the polished surface, but the organ, as an agent, also produces an action, as is proper to a brilliant object. For sight is the property of an organ possessing brilliance and colour. The eyes, therefore, have

their proper action as have other parts of the body. Because it is natural to the eye to be filled with blood-vessels, a woman's eyes, during the period of menstrual flux and inflammation, will undergo a change, although her husband will not note this since his seed is of the same nature as that of his wife. The surrounding atmosphere, through which operates the action of sight, and which surrounds the mirror also, will undergo a change of the same sort that occurred shortly before in the woman's eyes, and hence the surface of the mirror is likewise affected. And as in the case of a garment, the cleaner it is the more quickly it is soiled, so the same holds true in the case of the mirror. For anything that is clean will show quite clearly a stain that it chances to receive, and the cleanest object shows up even the slightest stain. A bronze mirror, because of its shininess, is especially sensitive to any sort of contact (the movement of the surrounding air acts upon it like a rubbing or pressing or wiping); on that account, therefore, what is clean will show up clearly the slightest touch on its surface. It is hard to cleanse smudges off new mirrors because the stain penetrates deeply and is suffused to all parts; it penetrates deeply because the mirror is not a dense medium, and is suffused widely because of the smoothness of the object. On the other hand, in the case of old mirrors, stains do not remain because they do not penetrate deeply, but only smudge the surface.

From this therefore it is plain that stimulatory motion is set up even by slight differences, and that sense-perception is quick to respond to it; and further that the organ which perceives colour is not only affected by its object, but also reacts upon it. Further evidence to the same point is afforded by what takes place in wines, and in the manufacture of unguents. For both oil, when prepared, and wine become rapidly infected by the odours of the things near them; they not only acquire the odours of the things thrown into or mixed with them, but also those of the

things which are placed, or which grow, near the vessels containing them.

In order to answer our original question, let us now, therefore, assume one proposition, which is clear from what precedes, viz. that even when the external object of perception has departed, the impressions it has made persist, and are themselves objects of perception: and [let us assume], besides, that we are easily deceived respecting the operations of sense-perception when we are excited by emotions, and different persons according to their different emotions; for example, the coward when excited by fear, the amorous person by amorous desire; so that, with but little resemblance to go upon, the former thinks he sees his foes approaching, the latter, that he sees the object of his desire; and the more deeply one is under the influence of the emotion, the less similarity is required to give rise to these illusory impressions. Thus too, both in fits of anger, and also in all states of appetite, all men become easily deceived, and more so the more their emotions are excited. This is the reason too why persons in the delirium of fever sometimes think they see animals on their chamber walls, an illusion arising from the faint resemblance to animals of the markings thereon when put together in patterns; and this sometimes corresponds with the emotional states of the sufferers, in such a way that, if the latter be not very ill, they know well enough that it is an illusion; but if the illness is more severe they actually move according to the appearances. The cause of these occurrences is that the faculty in virtue of which the controlling sense judges is not identical with that in virtue of which presentations come before the mind. A proof of this is, that the sun presents itself as only a foot in diameter, though often something else gainsays the presentation. Again, when the fingers are crossed, the one object [placed between them] is felt [by the touch] as two; but yet we deny that it is two; for sight is more authoritative than touch. Yet, if touch stood alone, we should actually have

pronounced the one object to be two. The ground of such false judgements is that any appearances whatever present themselves, not only when its object stimulates a sense, but also when the sense by itself alone is stimulated, provided only it be stimulated in the same manner as it is by the object. For example, to persons sailing past the land seems to move, when it is really the eye that is being moved by something else [the moving ship.]

3

From this it is manifest that the stimulatory movements based upon sensory impressions, whether the latter are derived from external objects or from causes within the body, present themselves not only when persons are awake, but also then, when this affection which is called sleep has come upon them, with even greater impressiveness. For by day, while the senses and the intellect are working together, they (i.e. such movements) are extruded from consciousness or obscured, just as a smaller is beside a larger fire, or as small beside great pains or pleasures, though, as soon as the latter have ceased, even those which are trifling emerge into notice. But by night [i.e. in sleep] owing to the inaction of the particular senses, and their powerlessness to realize themselves, which arises from the reflux of the hot from the exterior parts to the interior, they [i.e. the above 'movements'] are borne in to the head quarters of sense-perception, and there display themselves as the disturbance (of waking life) subsides. We must suppose that, like the little eddies which are being ever formed in rivers, so the sensory movements are each a continuous process, often remaining like what they were when first started, but often, too, broken into other forms by collisions with obstacles. This [last

mentioned point], moreover, gives the reason why no dreams occur in sleep immediately after meals, or to sleepers who are extremely young, e.g. to infants. The internal movement in such cases is excessive, owing to the heat generated from the food. Hence, just as in a liquid, if one vehemently disturbs it, sometimes no reflected image appears, while at other times one appears, indeed, but utterly distorted, so as to seem quite unlike its original; while, when once the motion has ceased, the reflected images are clear and plain; in the same manner during sleep the phantasms, or residuary movements, which are based upon the sensory impressions, become sometimes quite obliterated by the above described motion when too violent; while at other times the sights are indeed seen, but confused and weird, and the dreams [which then appear] are unhealthy, like those of persons who are atrabilious, or feverish, or intoxicated with wine. For all such affections, being spirituous, cause much commotion and disturbance. In sanguineous animals, in proportion as the blood becomes calm, and as its purer are separated from its less pure elements, the fact that the movement, based on impressions derived from each of the organs of sense, is preserved in its integrity, renders the dreams healthy, causes a [clear] image to present itself, and makes the dreamer think, owing to the effects borne in from the organ of sight, that he actually sees, and owing to those which come from the organ of hearing, that he really hears; and so on with those also which proceed from the other sensory organs. For it is owing to the fact that the movement which reaches the primary organ of sense comes from them, that one even when awake believes himself to see, or hear, or otherwise perceive; just as it is from a belief that the organ of sight is being stimulated, though in reality not so stimulated, that we sometimes erroneously declare ourselves to see, or that, from the fact that touch announces two movements, we think that the one object is two. For, as a rule, the governing sense affirms

the report of each particular sense, unless another particular sense, more authoritative, makes a contradictory report. In every case an appearance presents itself, but what appears does not in every case seem real, unless when the deciding faculty is inhibited, or does not move with its proper motion. Moreover, as we said that different men are subject to illusions, each according to the different emotion present in him, so it is that the sleeper, owing to sleep, and to the movements then going on in his sensory organs, as well as to the other facts of the sensory process, [is liable to illusion], so that the dream presentation, though but little like it, appears as some actual given thing. For when one is asleep, in proportion as most of the blood sinks inwards to its fountain [the heart], the internal [sensory] movements, some potential, others actual accompany it inwards. They are so related [in general] that, if anything move the blood, some one sensory movement will emerge from it, while if this perishes another will take its place; while to one another also they are related in the same way as the artificial frogs in water which severally rise [in fixed succesion] to the surface in the order in which the salt [which keeps them down] becomes dissolved. The residuary movements are like these: they are within the soul potentially, but actualize themselves only when the impediment to their doing so has been relaxed; and according as they are thus set free, they begin to move in the blood which remains in the sensory organs, and which is now but scanty, while they possess verisimilitude after the manner of cloud-shapes, which in their rapid metamorphoses one compares now to human beings and a moment afterwards to centaurs. Each of them is however, as has been said, the remnant of a sensory impression taken when sense was actualizing itself; and when this, the true impression, has departed, its remnant is still immanent, and it is correct to say of it, that though not actually Koriskos, it is like Koriskos. For when the person was actually perceiving, his controlling and

judging sensory faculty did not call it Koriskos, but, prompted by this [impression], called the genuine person yonder Koriskos. Accordingly, this sensory impulse, which, when actually perceiving, it [the controlling faculty] describes (unless completely inhibited by the blood), it now [in dreams] when quasi-perceiving, receives from the movements persisting in the sense-organs, and mistakes it – an impulse that is merely like the true [objective] impression – for the true impression itself, while the effect of sleep is so great that it causes this mistake to pass unnoticed. Accordingly, just as if a finger be inserted beneath the eyeball without being observed, one object will not only present two visual images, but will create an opinion of its being two objects; while if it [the finger] be observed, the presentation will be the same, but the same opinion will not be formed of it; exactly so it is in states of sleep: if the sleeper perceives that he is asleep, and is conscious of the sleeping state during which the perception comes before his mind, it presents itself still, but something within him speaks to this effect: 'the image of Koriskos presents itself, but the real Koriskos is not present'; for often, when one is asleep, there is something in consciousness which declares that what then presents itself is but a dream. If, however, he is not aware of being asleep, there is nothing which will contradict the testimony of the bare presentation.

That what we here urge is true, i.e. that there are such presentative movements in the sensory organs, any one may convince himself, if he attends to and tries to remember the affections we experience when sinking into slumber or when being awakened. He will sometimes, in the moment of awakening, surprise the images which present themselves to him in sleep, and find that they are really but movements lurking in the organs of sense. And indeed some very young persons, if it is dark, though looking with wide open eyes, see

multitudes of phantom figures moving before them, so that they often cover up their heads in terror.

From all this, then, the conclusion to be drawn is, that the dream is a sort of presentation, and, more particularly, one which occurs in sleep; since the phantoms just mentioned are not dreams, nor is any other a dream which presents itself when the sense-perceptions are in a state of freedom. Nor is every presentation which occurs in sleep necessarily a dream. For in the first place, some persons [when asleep] actually, in a certain way, perceive sounds, light, savour, and contact; feebly, however, and, as it were, remotely. For there have been cases in which persons while asleep, but with the eyes partly open, saw faintly in their sleep (as they supposed) the light of a lamp, and afterwards, on being awakened, straightway recognized it as the actual light of a real lamp; while, in other cases, persons who faintly heard the crowing of cocks or the barking of dogs identified these clearly with the real sounds as soon as they awoke. Some persons, too, return answers to questions put to them in sleep. For it is quite possible that, of waking or sleeping, while the one is present in the ordinary sense, the other also should be present in a certain way. But none of these occurrences should be called a dream. Nor should the true thoughts, as distinct from the mere presentations, which occur in sleep [be called dreams]. The dream proper is a presentation based on the movement of sense impressions, when such presentation occurs during sleep, taking sleep in the strict sense of the term.

There are cases of persons who in their whole lives have never had a dream, while others dream when considerably advanced in years, having never dreamed before. The cause of their not having dreams appears somewhat like that which operates in the case of infants, and [that which operates] immediately after meals. It is intelligible enough that no dream-presentation

should occur to persons whose natural constitution is such that in them copious evaporation is borne upwards, which, when borne back downwards, causes a large quantity of motion. But it is not surprising that, as age advances, a dream should at length appear to them. Indeed, it is inevitable that, as a change is wrought in them in proportion to age or emotional experience, this reversal [from non-dreaming to dreaming] should occur also.

On Prophesying by Dreams

translated by J. I. Beare

1

As to the divination which takes place in sleep, and is said to be based on dreams, we cannot lightly either dismiss it with contempt or give it implicit confidence. The fact that all persons, or many, suppose dreams to possess a special significance, tends to inspire us with belief in it [such divination], as founded on the testimony of experience; and indeed that divination in dreams should, as regards some subjects, be genuine, is not incredible, for it has a show of reason; from which one might form a like opinion also respecting all other dreams. Yet the fact of our seeing no probable cause to account for such divination tends to inspire us with distrust. For, in addition to its further unreasonableness, it is absurd to combine the idea that the sender of such dreams

should be God with the fact that those to whom he sends them are not the best and wisest, but merely commonplace persons. If, however, we abstract from the causality of God, none of the other causes assigned appears probable. For that certain persons should have foresight in dreams concerning things destined to take place at the Pillars of Hercules, or on the banks of the Borysthenes, seems to be something to discover the explanation of which surpasses the wit of man. Well then, the dreams in question must be regarded either as causes, or as tokens, of the events, or else as coincidences; either as all, or some, of these, or as one only. I use the word 'cause' in the sense in which the moon is [the cause] of an eclipse of the sun, or in which fatigue is [a cause] of fever; 'token' [in the sense in which] the entrance of a star [into the shadow] is a token of the eclipse, or [in which] roughness of the tongue [is a token] of fever; while by 'coincidence' I mean, for example, the occurrence of an eclipse of the sun while some one is taking a walk; for the walking is neither a token nor a cause of the eclipse, nor the eclipse [a cause or token] of the walking. For this reason no coincidence takes place according to a universal or general rule. Are we then to say that some dreams are causes, others tokens, e.g. of events taking place in the bodily organism? At all events, even scientific physicians tell us that one should pay diligent attention to dreams, and to hold this view is reasonable also for those who are not practitioners, but speculative philosophers. For the movements which occur in the daytime [within the body] are, unless very great and violent, lost sight of in contrast with the waking movements, which are more impressive. In sleep the opposite takes place, for then even trifling movements seem considerable. This is plain in what often happens during sleep; for example, dreamers fancy that they are affected by thunder and lightning, when in fact there are only faint ringings in their ears; or that they are enjoying honey or other sweet savours, when only a tiny drop of

phlegm is flowing down [the oesophagus]; or that they are walking through fire, and feeling intense heat, when there is only a slight warmth affecting certain parts of the body. When they are awakened, these things appear to them in this their true character. But since the beginnings of all events are small, so, it is clear, are those also of the diseases or other affections about to occur in our bodies. In conclusion, it is manifest that these beginnings must be more evident in sleeping than in waking moments.

Nay, indeed, it is not improbable that some of the presentations which come before the mind in sleep may even be causes of the actions cognate to each of them. For as when we are about to act [in waking hours], or are engaged in any course of action, or have already performed certain actions, we often find ourselves concerned with these actions, or performing them, in a vivid dream; the cause whereof is that the dream-movement has had a way paved for it from the original movements set up in the daytime; exactly so, but conversely, it must happen that the movements set up first in sleep should also prove to be starting-points of actions to be performed in the daytime, since the recurrence by day of the thought of these actions also has had its way paved for it in the images before the mind at night. Thus then it is quite conceivable that some dreams may be tokens and causes [of future events].

Most [so-called prophetic] dreams are, however, to be classed as mere coincidences, especially all such as are extravagant, and those in the fulfilment of which the dreamers have no initiative, such as in the case of a sea-fight, or of things taking place far away. As regards these it is natural that the fact should stand as it does whenever a person, on mentioning something, finds the very thing mentioned come to pass. Why, indeed, should this not happen also in sleep? The probability is, rather, that many such things should happen. As, then, one's mentioning a

particular person is neither token nor cause of this person's presenting himself, so, in the parallel instance, the dream is, to him who has seen it, neither token nor cause of its [so-called] fulfilment, but a mere coincidence. Hence the fact that many dreams have no 'fulfilment', for coincidence do not occur according to any universal or general law.

2

On the whole, forasmuch as certain of the lower animals also dream, it may be concluded that dreams are not sent by God, nor are they designed for this purpose [to reveal the future]. They have a divine aspect, however, for Nature [their cause] is divinely planned, though not itself divine. A special proof [of their not being sent by God] is this: the power of foreseeing the future and of having vivid dreams is found in persons of inferior type, which implies that God does not send their dreams; but merely that all those whose physical temperament is, as it were, garrulous and excitable, see sights of all descriptions; for, inasmuch as they experience many movements of every kind, they just chance to have visions resembling objective facts, their luck in these matters being merely like that of persons who play at even and odd. For the principle which is expressed in the gambler's maxim: 'If you make many throws your luck must change,' holds in their case also.

That many dreams have no fulfilment is not strange, for it is so too with many bodily toms and weather-signs, e.g. those of train or wind. For if another movement occurs more influential than that from which, while [the event to which it pointed was] still future, the given token was derived, the event [to which such token pointed] does not take place. So, of the things which

ought to be accomplished by human agency, many, though well-planned are by the operation of other principles more powerful [than man's agency] brought to nought. For, speaking generally, that which was about to happen is not in every case what now is happening, nor is that which shall hereafter he identical with that which is now going to be. Still, however, we must hold that the beginnings from which, as we said, no consummation follows, are real beginnings, and these constitute natural tokens of certain events, even though the events do not come to pass.

As for [prophetic] dreams which involve not such beginnings [sc. of future events] as we have here described, but such as are extravagant in times, or places, or magnitudes; or those involving beginnings which are not extravagant in any of these respects, while yet the persons who see the dream hold not in their own hands the beginnings [of the event to which it points]: unless the foresight which such dreams give is the result of pure coincidence, the following would be a better explanation of it than that proposed by Democritus, who alleges 'images' and 'emanations' as its cause. As, when something has caused motion in water or air, this [the portion of water or air], and, though the cause has ceased to operate, such motion propagates itself to a certain point, though there the prime movement is not present; just so it may well be that a movement and a consequent sense-perception should reach sleeping souls from the objects from which Democritus represents 'images' and 'emanations' coming; that such movements, in whatever way they arrive, should be more perceptible at night [than by day], because when proceeding thus in the daytime they are more liable to dissolution (since at night the air is less disturbed, there being then less wind); and that they shall be perceived within the body owing to sleep, since persons are more sensitive even to slight sensory movements when asleep than when awake. It is these movements then that cause 'presentations', as a result of which

sleepers foresee the future even relatively to such events as those referred to above. These considerations also explain why this experience befalls commonplace persons and not the most intelligent. For it would have regularly occurred both in the daytime and to the wise had it been God who sent it; but, as we have explained the matter, it is quite natural that commonplace persons should be those who have foresight [in dreams]. For the mind of such persons is not given to thinking, but, as it were, derelict, or totally vacant, and, when once set moving, is borne passively on in the direction taken by that which moves it. With regard to the fact that some persons who are liable to derangement have this foresight, its explanation is that their normal mental movements do not impede [the alien movements], but are beaten off by the latter. Therefore it is that they have an especially keen perception of the alien movements.

That certain persons in particular should have vivid dreams, e.g. that familiar friends should thus have foresight in a special degree respecting one another, is due to the fact that such friends are most solicitous on one another's behalf. For as acquaintances in particular recognize and perceive one another a long way off, so also they do as regards the sensory movements respecting one another; for sensory movements which refer to persons familiarly known are themselves more familiar. Atrabilious persons, owing to their impetuosity, are, when they, as it were, shoot from a distance, expert at hitting; while, owing to their mutability, the series of movements deploys quickly before their minds. For even as the insane recite, or con over in thought, the poems of Philaegides, e.g. the Aphrodite, whose parts succeed in order of similitude, just so do they [the 'atrabilious'] go on and on stringing sensory movements together. Moreover, owing to their aforesaid impetuosity, one movement within them is not liable to be knocked out of its course by some other movement.

The most skilful interpreter of dreams is he who has the faculty of observing resemblances. Any one may interpret dreams which are vivid and plain. But, speaking of 'resemblances', I mean that dream presentations are analogous to the forms reflected in water, as indeed we have already stated. In the latter case, if the motion in the water be great, the reflexion has no resemblance to its original, nor do the forms resemble the real objects. Skilful, indeed, would he be in interpreting such reflexions who could rapidly discern, and at a glance comprehend, the scattered and distorted fragments of such forms, so as to perceive that one of them represents a man, or a horse, Or anything whatever. Accordingly, in the other case also, in a similar way, some such thing as this [blurred image] is all that a dream amounts to; for the internal movement effaces the clearness of the dream.

The questions, therefore, which we proposed as to the nature of sleep and the dream, and the cause to which each of them is due, and also as to divination as a result of dreams, in every form of it, have now been discussed.

On Longevity and Shortness of Life

translated by G. R. T. Ross

1

The reasons for some animals being long-lived and others short-lived, and, in a word, causes of the length and brevity of life call for investigation.

The necessary beginning to our inquiry is a statement of the difficulties about these points. For it is not clear whether in animals and plants universally it is a single or diverse cause that makes some to be long-lived, others short-lived. Plants too have in some cases a long life, while in others it lasts but for a year.

Further, in a natural structure are longevity and a sound constitution coincident, or is shortness of life independent of unhealthiness? Perhaps in the case of certain maladies a diseased state of the body and shortness of life are interchangeable, while in the case of others ill-health is perfectly compatible with long life.

Of sleep and waking we have already treated; about life and death we shall speak later on, and likewise about health and disease, in so far as it belongs to the science of nature to do so. But at present we have to investigate the causes of some creatures being long-lived, and others short-lived. We find this distinction affecting not only entire genera opposed as wholes to one another, but applying also to contrasted sets of individuals within the same species. As an instance of the difference applying to the genus I give man and horse (for

mankind has a longer life than the horse), while within the species there is the difference between man and man; for of men also some are long-lived, others short-lived, differing from each other in respect of the different regions in which they dwell. Races inhabiting warm countries have longer life, those living in a cold climate live a shorter time. Likewise there are similar differences among individuals occupying the same locality.

2

In order to find premisses for our argument, we must answer the question, What is that which, in natural objects, makes them easily destroyed, or the reverse? Since fire and water, and whatsoever is akin thereto, do not possess identical powers they are reciprocal causes of generation and decay. Hence it is natural to infer that everything else arising from them and composed of them should share in the same nature, in all cases where things are not, like a house, a composite unity formed by the synthesis of many things.

In other matters a different account must be given; for in many things their mode of dissolution is something peculiar to themselves, e.g. in knowledge and health and disease. These pass away even though the medium in which they are found is not destroyed but continues to exist; for example, take the termination of ignorance, which is recollection or learning, while knowledge passes away into forgetfulness, or error. But accidentally the disintegration of a natural object is accompanied by the destruction of the non-physical reality; for, when the animal dies, the health or knowledge resident in it passes away too. Hence from these considerations we may draw

a conclusion about the soul too; for, if the inherence of soul in body is not a matter of nature but like that of knowledge in the soul, there would be another mode of dissolution pertaining to it besides that which occurs when the body is destroyed. But since evidently it does not admit of this dual dissolution, the soul must stand in a different case in respect of its union with the body.

3

Perhaps one might reasonably raise the question whether there is any place where what is corruptible becomes incorruptible, as fire does in the upper regions where it meets with no opposite. Opposites destroy each other, and hence accidentally, by their destruction, whatsoever is attributed to them is destroyed. But no opposite in a real substance is accidentally destroyed, because real substance is not predicated of any subject. Hence a thing which has no opposite, or which is situated where it has no opposite, cannot be destroyed. For what will that be which can destroy it, if destruction comes only through contraries, but no contrary to it exists either absolutely or in the particular place where it is? But perhaps this is in one sense true, in another sense not true, for it is impossible that anything containing matter should not have in any sense an opposite. Heat and straightness can be present in every part of a thing, but it is impossible that the thing should be nothing but hot or white or straight; for, if that were so, attributes would have an independent existence. Hence if, in all cases, whenever the active and the passive exist together, the one acts and the other is acted on, it is impossible that no change should occur. Further, this is so if a waste product is an opposite, and waste must always be produced; for opposition is always the source of

change, and refuse is what remains of the previous opposite. But, after expelling everything of a nature actually opposed, would an object in this case also be imperishable? No, it would be destroyed by the environment.

If then that is so, what we have said sufficiently accounts for the change; but, if not, we must assume that something of actually opposite character is in the changing object, and refuse is produced.

Hence accidentally a lesser flame is consumed by a greater one, for the nutriment, to wit the smoke, which the former takes a long period to expend, is used up by the big flame quickly.

Hence [too] all things are at all times in a state of transition and are coming into being and passing away. The environment acts on them either favourably or antagonistically, and, owing to this, things that change their situation become more or less enduring than their nature warrants, but never are they eternal when they contain contrary qualities; for their matter is an immediate source of contrariety, so that if it involves locality they show change of situation, if quantity, increase and diminution, while if it involves qualitative affection we find alteration of character.

4

We find that a superior immunity from decay attaches neither to the largest animals (the horse has shorter life than man) nor to those that are small (for most insects live but for a year). Nor are plants as a whole less liable to perish than animals (many plants are annuals), nor have sanguineous animals the pre-eminence (for the bee is longer-lived than certain sanguineous

animals). Neither is it the bloodless animals that live longest (for molluscs live only a year, though bloodless), nor terrestrial organisms (there are both plants and terrestrial animals of which a single year is the period), nor the occupants of the sea (for there we find the crustaceans and the molluscs, which are short-lived).

Speaking generally, the longest-lived things occur among the plants, e.g. the date-palm. Next in order we find them among the sanguineous animals rather than among the bloodless, and among those with feet rather than among the denizens of the water. Hence, taking these two characters together, the longest-lived animals fall among sanguineous animals which have feet, e.g. man and elephant. As a matter of fact also it is a general rule that the larger live longer than the smaller, for the other long-lived animals too happen to be of a large size, as are also those I have mentioned.

5

The following considerations may enable us to understand the reasons for all these facts. We must remember that an animal is by nature humid and warm, and to live is to be of such a constitution, while old age is dry and cold, and so is a corpse. This is plain to observation. But the material constituting the bodies of all things consists of the following – the hot and the cold, the dry and the moist. Hence when they age they must become dry, and therefore the fluid in them requires to be not easily dried up. Thus we explain why fat things are not liable to decay. The reason is that they contain air; now air relatively to the other elements is fire, and fire never becomes corrupted.

Again the humid element in animals must not be small in quantity, for a small quantity is easily dried up. This is why both plants and animals that are large are, as a general rule, longer-lived than the rest, as was said before; it is to be expected that the larger should contain more moisture. But it is not merely this that makes them longer lived; for the cause is twofold, to wit, the quality as well as the quantity of the fluid. Hence the moisture must be not only great in amount but also warm, in order to be neither easily congealed nor easily dried up.

It is for this reason also that man lives longer than some animals which are larger; for animals live longer though there is a deficiency in the amount of their moisture, if the ratio of its qualitative superiority exceeds that of its quantitative deficiency.

In some creatures the warm element is their fatty substance, which prevents at once desiccation and congelation; but in others it assumes a different flavour. Further, that which is designed to be not easily destroyed should not yield waste products. Anything of such a nature causes death either by disease or naturally, for the potency of the waste product works adversely and destroys now the entire constitution, now a particular member.

This is why salacious animals and those abounding in seed age quickly; the seed is a residue, and further, by being lost, it produces dryness. Hence the mule lives longer than either the horse or the ass from which it sprang, and females live longer than males if the males are salacious. Accordingly cock-sparrows have a shorter life than the females. Again males subject to great toil are short-lived and age more quickly owing to the labour; toil produces dryness and old age is dry. But by natural constitution and as a general rule males live longer than

females, and the reason is that the male is an animal with more warmth than the female.

The same kind of animals are longer-lived in warm than in cold climates for the same reason, on account of which they are of larger size. The size of animals of cold constitution illustrates this particularly well, and hence snakes and lizards and scaly reptiles are of great size in warm localities, as also are testacea in the Red Sea: the warm humidity there is the cause equally of their augmented size and of their life. But in cold countries the humidity in animals is more of a watery nature, and hence is readily congealed. Consequently it happens that animals with little or no blood are in northerly regions either entirely absent (both the land animals with feet and the water creatures whose home is the sea) or, when they do occur, they are smaller and have shorter life; for the frost prevents growth.

Both plants and animals perish if not fed, for in that case they consume themselves; just as a large flame consumes and burns up a small one by using up its nutriment, so the natural warmth which is the primary cause of digestion consumes the material in which it is located.

Water animals have a shorter life than terrestrial creatures, not strictly because they are humid, but because they are watery, and watery moisture is easily destroyed, since it is cold and readily congealed. For the same reason bloodless animals perish readily unless protected by great size, for there is neither fatness nor sweetness about them. In animals fat is sweet, and hence bees are longer-lived than other animals of larger size.

6

It is amongst the plants that we find the longest life – more than among the animals, for, in the first place, they are less watery and hence less easily frozen. Further they have an oiliness and a viscosity which makes them retain their moisture in a form not easily dried up, even though they are dry and earthy.

But we must discover the reason why trees are of an enduring constitution, for it is peculiar to them and is not found in any animals except the insects.

Plants continually renew themselves and hence last for a long time. New shoots continually come and the others grow old, and with the roots the same thing happens. But both processes do not occur together. Rather it happens that at one time the trunk and the branches alone die and new ones grow up beside them, and it is only when this has taken place that the fresh roots spring from the surviving part. Thus it continues, one part dying and the other growing, and hence also it lives a long time.

There is a similarity, as has been already said, between plants and insects, for they live, though divided, and two or more may be derived from a single one. Insects, however, though managing to live, are not able to do so long, for they do not possess organs; nor can the principle resident in each of the separated parts create organs. In the case of a plant, however, it can do so; every part of a plant contains potentially both root and stem. Hence it is from this source that issues that continued growth when one part is renewed and the other grows old; it is practically a case of longevity. The taking of slips furnishes a similar instance, for we might say that, in a way, when we take a slip the same thing happens; the shoot cut off is part of the plant. Thus in taking slips this perpetuation of life occurs though their connexion with the plant is severed, but in

the former case it is the continuity that is operative. The reason is that the life principle potentially belonging to them is present in every part.

Identical phenomena are found both in plants and in animals. For in animals the males are, in general, the longer-lived. They have their upper parts larger than the lower (the male is more of the dwarf type of build than the female), and it is in the upper part that warmth resides, in the lower cold. In plants also those with great heads are longer-lived, and such are those that are not annual but of the tree-type, for the roots are the head and upper part of a plant, and among the annuals growth occurs in the direction of their lower parts and the fruit.

These matters however will be specially investigated in the work On Plants. But this is our account of the reasons for the duration of life and for short life in animals. It remains for us to discuss youth and age, and life and death. To come to a definite understanding about these matters would complete our course of study on animals.

On Youth and Old Age, On Breathing, On Life and Death

translated by G. R. T. Ross

1

We must now treat of youth and old age and life and death. We must probably also at the same time state the causes of respiration as well, since in some cases living and the reverse depend on this.

We have elsewhere given a precise account of the soul, and while it is clear that its essential reality cannot be corporeal, yet manifestly it must exist in some bodily part which must be one of those possessing control over the members. Let us for the present set aside the other divisions or faculties of the soul (whichever of the two be the correct name). But as to being what is called an animal and a living thing, we find that in all beings endowed with both characteristics (viz. being an animal and being alive) there must be a single identical part in virtue of which they live and are called animals; for an animal qua animal cannot avoid being alive. But a thing need not, though alive, be animal, for plants live without having sensation, and it is by sensation that we distinguish animal from what is not animal.

This organ, then, must be numerically one and the same and yet possess multiple and disparate aspects, for being animal and living are not identical. Since then the organs of special sensation have one common organ in which the senses when functioning must meet, and this must be situated midway between what is called before and behind (we call 'before' the direction from which sensation comes, 'behind' the opposite),

further, since in all living things the body is divided into upper and lower (they all have upper and lower parts, so that this is true of plants as well), clearly the nutritive principle must be situated midway between these regions. That part where food enters we call upper, considering it by itself and not relatively to the surrounding universe, while downward is that part by which the primary excrement is discharged.

Plants are the reverse of animals in this respect. To man in particular among the animals, on account of his erect stature, belongs the characteristic of having his upper parts pointing upwards in the sense in which that applies to the universe, while in the others these are in an intermediate position. But in plants, owing to their being stationary and drawing their sustenance from the ground, the upper part must always be down; for there is a correspondence between the roots in a plant and what is called the mouth in animals, by means of which they take in their food, whether the source of supply be the earth or each other's bodies.

2

All perfectly formed animals are to be divided into three parts, one that by which food is taken in, one that by which excrement is discharged, and the third the region intermediate between them. In the largest animals this latter is called the chest and in the others something corresponding; in some also it is more distinctly marked off than in others. All those also that are capable of progression have additional members subservient to this purpose, by means of which they bear the whole trunk, to wit legs and feet and whatever parts are possessed of the same powers. Now it is evident both by observation and by inference

that the source of the nutritive soul is in the midst of the three parts. For many animals, when either part – the head or the receptacle of the food – is cut off, retain life in that member to which the middle remains attached. This can be seen to occur in many insects, e.g. wasps and bees, and many animals also besides insects can, though divided, continue to live by means of the part connected with nutrition.

While this member is indeed in actuality single, yet potentially it is multiple, for these animals have a constitution similar to that of Plants; plants when cut into sections continue to live, and a number of trees can be derived from one single source. A separate account will be given of the reason why some plants cannot live when divided, while others can be propagated by the taking of slips. In this respect, however, plants and insects are alike.

It is true that the nutritive soul, in beings possessing it, while actually single must be potentially plural. And it is too with the principle of sensation, for evidently the divided segments of these animals have sensation. They are unable, however, to preserve their constitution, as plants can, not possessing the organs on which the continuance of life depends, for some lack the means for seizing, others for receiving their food; or again they may be destitute of other organs as well.

Divisible animals are like a number of animals grown together, but animals of superior construction behave differently because their constitution is a unity of the highest possible kind. Hence some of the organs on division display slight sensitiveness because they retain some psychical susceptibility; the animals continue to move after the vitals have been abstracted: tortoises, for example, do so even after the heart has been removed.

3

The same phenomenon is evident both in plants and in animals, and in plants we note it both in their propagation by seed and in grafts and cuttings. Genesis from seeds always starts from the middle. All seeds are bivalvular, and the place of junction is situated at the point of attachment (to the plant), an intermediate part belonging to both halves. It is from this part that both root and stem of growing things emerge; the starting-point is in a central position between them. In the case of grafts and cuttings this is particularly true of the buds; for the bud is in a way the starting-point of the branch, but at the same time it is in a central position. Hence it is either this that is cut off, or into this that the new shoot is inserted, when we wish either a new branch or a new root to spring from it; which proves that the point of origin in growth is intermediate between stem and root.

Likewise in sanguineous animals the heart is the first organ developed; this is evident from what has been observed in those cases where observation of their growth is possible. Hence in bloodless animals also what corresponds to the heart must develop first. We have already asserted in our treatise on The Parts of Animals that it is from the heart that the veins issue, and that in sanguineous animals the blood is the final nutriment from which the members are formed. Hence it is clear that there is one function in nutrition which the mouth has the faculty of performing, and a different one appertaining to the stomach. But it is the heart that has supreme control, exercising an additional and completing function. Hence in sanguineous animals the source both of the sensitive and of the nutritive soul must be in the heart, for the functions relative to nutrition exercised by the other parts are ancillary to the

activity of the heart. It is the part of the dominating organ to achieve the final result, as of the physician's efforts to be directed towards health, and not to be occupied with subordinate offices.

Certainly, however, all saguineous animals have the supreme organ of the sensefaculties in the heart, for it is here that we must look for the common sensorium belonging to all the sense-organs. These in two cases, taste and touch, can be clearly seen to extend to the heart, and hence the others also must lead to it, for in it the other organs may possibly initiate changes, whereas with the upper region of the body taste and touch have no connexion. Apart from these considerations, if the life is always located in this part, evidently the principle of sensation must be situated there too, for it is qua animal that an animal is said to be a living thing, and it is called animal because endowed with sensation. Elsewhere in other works we have stated the reasons why some of the sense-organs are, as is evident, connected with the heart, while others are situated in the head. (It is this fact that causes some people to think that it is in virtue of the brain that the function of perception belongs to animals.)

4

Thus if, on the one hand, we look to the observed facts, what we have said makes it clear that the source of the sensitive soul, together with that connected with growth and nutrition, is situated in this organ and in the central one of the three divisions of the body. But it follows by deduction also; for we see that in every case, when several results are open to her, Nature always brings to pass the best. Now if both principles are

located in the midst of the substance, the two parts of the body, viz. that which elaborates and that which receives the nutriment in its final form will best perform their appropriate function; for the soul will then be close to each, and the central situation which it will, as such, occupy is the position of a dominating power.

Further, that which employs an instrument and the instrument it employs must be distinct (and must be spatially diverse too, if possible, as in capacity), just as the flute and that which plays it – the hand – are diverse. Thus if animal is defined by the possession of sensitive soul, this soul must in the sanguineous animals be in the heart, and, in the bloodless ones, in the corresponding part of their body. But in animals all the members and the whole body possess some connate warmth of constitution, and hence when alive they are observed to be warm, but when dead and deprived of life they are the opposite. Indeed, the source of this warmth must be in the heart in sanguineous animals, and in the case of bloodless animals in the corresponding organ, for, though all parts of the body by means of their natural heat elaborate and concoct the nutriment, the governing organ takes the chief share in this process. Hence, though the other members become cold, life remains; but when the warmth here is quenched, death always ensues, because the source of heat in all the other members depends on this, and the soul is, as it were, set aglow with fire in this part, which in sanguineous animals is the heart and in the bloodless order the analogous member. Hence, of necessity, life must be coincident with the maintenance of heat, and what we call death is its destruction.

5

However, it is to be noticed that there are two ways in which fire ceases to exist; it may go out either by exhaustion or by extinction. That which is self-caused we call exhaustion, that due to its opposites extinction. [The former is that due to old age, the latter to violence.] But either of these ways in which fire ceases to be may be brought about by the same cause, for, when there is a deficiency of nutriment and the warmth can obtain no maintenance, the fire fails; and the reason is that the opposite, checking digestion, prevents the fire from being fed. But in other cases the result is exhaustion, when the heat accumulates excessively owing to lack of respiration and of refrigeration. For in this case what happens is that the heat, accumulating in great quantity, quickly uses up its nutriment and consumes it all before more is sent up by evaporation. Hence not only is a smaller fire readily put out by a large one, but of itself the candle flame is consumed when inserted in a large blaze just as is the case with any other combustible. The reason is that the nutriment in the flame is seized by the larger one before fresh fuel can be added, for fire is ever coming into being and rushing just like a river, but so speedily as to elude observation.

Clearly therefore, if the bodily heat must be conserved (as is necessary if life is to continue), there must be some way of cooling the heat resident in the source of warmth. Take as an illustration what occurs when coals are confined in a brazier. If they are kept covered up continuously by the so-called ‘choker’, they are quickly extinguished, but, if the lid is in rapid alternation lifted up and put on again they remain glowing for a long time. Banking up a fire also keeps it in, for the ashes, being porous, do not prevent the passage of air, and again they enable it to resist extinction by the surrounding air by means of the supply of heat which it possesses. However, we have stated in The Problems the reasons why these operations, namely

banking up and covering up a fire, have the opposite effects (in the one case the fire goes out, in the other it continues alive for a considerable time).

6

Everything living has soul, and it, as we have said, cannot exist without the presence of heat in the constitution. In plants the natural heat is sufficiently well kept alive by the aid which their nutriment and the surrounding air supply. For the food has a cooling effect [as it enters, just as it has in man] when first it is taken in, whereas abstinence from food produces heat and thirst. The air, if it be motionless, becomes hot, but by the entry of food a motion is set up which lasts until digestion is completed and so cools it. If the surrounding air is excessively cold owing to the time of year, there being severe frost, plants shrivel, or if, in the extreme heats of summer the moisture drawn from the ground cannot produce its cooling effect, the heat comes to an end by exhaustion. Trees suffering at such seasons are said to be blighted or star-stricken. Hence the practice of laying beneath the roots stones of certain species or water in pots, for the purpose of cooling the roots of the plants.

Some animals pass their life in the water, others in the air, and therefore these media furnish the source and means of refrigeration, water in the one case, air in the other. We must proceed – and it will require further application on our part – to give an account of the way and manner in which this refrigeration occurs.

7

A few of the previous physical philosophers have spoken of respiration. The reason, however, why it exists in animals they have either not declared or, when they have, their statements are not correct and show a comparative lack of acquaintance with the facts. Moreover they assert that all animals respire – which is untrue. Hence these points must first claim our attention, in order that we may not be thought to make unsubstantiated charges against authors no longer alive.

First then, it is evident that all animals with lungs breathe, but in some cases breathing animals have a bloodless and spongy lung, and then there is less need for respiration. These animals can remain under water for a time, which relatively to their bodily strength, is considerable. All oviparous animals, e.g. the frog-tribe, have a spongy lung. Also hemydes and tortoises can remain for a long time immersed in water; for their lung, containing little blood, has not much heat. Hence, when once it is inflated, it itself, by means of its motion, produces a cooling effect and enables the animal to remain immersed for a long time. Suffocation, however, always ensues if the animal is forced to hold its breath for too long a time, for none of this class take in water in the way fishes do. On the other hand, animals which have the lung charged with blood have greater need of respiration on account of the amount of their heat, while none at all of the others which do not possess lungs breathe.

8

Democritus of Abdera and certain others who have treated of respiration, while saying nothing definite about the lungless

animals, nevertheless seem to speak as if all breathed. But Anaxagoras and Diogenes both maintain that all breathe, and state the manner in which fishes and oysters respire. Anaxagoras says that when fishes discharge water through their gills, air is formed in the mouth, for there can be no vacuum, and that it is by drawing in this that they respire. Diogenes' statement is that, when they discharge water through their gills, they suck the air out of the water surrounding the mouth by means of the vacuum formed in the mouth, for he believes there is air in the water.

But these theories are untenable. Firstly, they state only what is the common element in both operations and so leave out the half of the matter. For what goes by the name of respiration consists, on the one hand, of inhalation, and, on the other, of the exhalation of breath; but, about the latter they say nothing, nor do they describe how such animals emit their breath. Indeed, explanation is for them impossible for, when the creatures respire, they must discharge their breath by the same passage as that by which they draw it in, and this must happen in alternation. Hence, as a result, they must take the water into their mouth at the same time as they breathe out. But the air and the water must meet and obstruct each other. Further, when they discharge the water they must emit their breath by the mouth or the gills, and the result will be that they will breathe in and breathe out at the same time, for it is at that moment that respiration is said to occur. But it is impossible that they should do both at the same time. Hence, if respiring creatures must both exhale and inhale the air, and if none of these animals can breathe out, evidently none can respire at all.

9

Further, the assertion that they draw in air out of the mouth or out of the water by means of the mouth is an impossibility, for, not having a lung, they have no windpipe; rather the stomach is closely juxtaposed to the mouth, so that they must do the sucking with the stomach. But in that case the other animals would do so also, which is not the truth; and the water-animals also would be seen to do it when out of the water, whereas quite evidently they do not. Further, in all animals that respire and draw breath there is to be observed a certain motion in the part of the body which draws in the air, but in the fishes this does not occur. Fishes do not appear to move any of the parts in the region of the stomach, except the gills alone, and these move both when they are in the water and when they are thrown on to dry land and gasp. Moreover, always when respiring animals are killed by being suffocated in water, bubbles are formed of the air which is forcibly discharged, as happens, e.g. when one forces a tortoise or a frog or any other animal of a similar class to stay beneath water. But with fishes this result never occurs, in whatsoever way we try to obtain it, since they do not contain air drawn from an external source. Again, the manner of respiration said to exist in them might occur in the case of men also when they are under water. For if fishes draw in air out of the surrounding water by means of their mouth why should not men too and other animals do so also; they should also, in the same way as fishes, draw in air out of the mouth. If in the former case it were possible, so also should it be in the latter. But, since in the one it is not so, neither does it occur in the other. Furthermore, why do fishes, if they respire, die in the air and gasp (as can be seen) as in suffocation? It is not want of food that produces this effect upon them, and the reason given by Diogenes is foolish, for he says that in air they take in too much air and hence die, but in the water they take in a moderate amount. But that should be a

possible occurrence with land animals also; as facts are, however, no land animal seems to be suffocated by excessive respiration. Again, if all animals breathe, insects must do so also. many of them seem to live though divided not merely into two, but into several parts, e.g. the class called Scolopendra. But how can they, when thus divided, breathe, and what is the organ they employ? The main reason why these writers have not given a good account of these facts is that they have no acquaintance with the internal organs, and that they did not accept the doctrine that there is a final cause for whatever Nature does. If they had asked for what purpose respiration exists in animals, and had considered this with reference to the organs, e.g. the gills and the lungs, they would have discovered the reason more speedily.

10

Democritus, however, does teach that in the breathing animals there is a certain result produced by respiration; he asserts that it prevents the soul from being extruded from the body. Nevertheless, he by no means asserts that it is for this purpose that Nature so contrives it, for he, like the other physical philosophers, altogether fails to attain to any such explanation. His statement is that the soul and the hot element are identical, being the primary forms among the spherical particles. Hence, when these are being crushed together by the surrounding atmosphere thrusting them out, respiration, according to his account, comes in to succour them. For in the air there are many of those particles which he calls mind and soul. Hence, when we breathe and the air enters, these enter along with it, and by their action cancel the pressure, thus preventing the expulsion of the soul which resides in the animal.

This explains why life and death are bound up with the taking in and letting out of the breath; for death occurs when the compression by the surrounding air gains the upper hand, and, the animal being unable to respire, the air from outside can no longer enter and counteract the compression. Death is the departure of those forms owing to the expulsive pressure exerted by the surrounding air. Death, however, occurs not by haphazard but, when natural, owing to old age, and, when unnatural, to violence.

But the reason for this and why all must die Democritus has by no means made clear. And yet, since evidently death occurs at one time of life and not at another, he should have said whether the cause is external or internal. Neither does he assign the cause of the beginning of respiration, nor say whether it is internal or external. Indeed, it is not the case that the external mind superintends the reinforcement; rather the origin of breathing and of the respiratory motion must be within: it is not due to pressure from around. It is absurd also that what surrounds should compress and at the same time by entering dilate. This then is practically his theory, and how he puts it.

But if we must consider that our previous account is true, and that respiration does not occur in every animal, we must deem that this explains death not universally, but only in respiring animals. Yet neither is it a good account of these even, as may clearly be seen from the facts and phenomena of which we all have experience. For in hot weather we grow warmer, and, having more need of respiration, we always breathe faster. But, when the air around is cold and contracts and solidifies the body, retardation of the breathing results. Yet this was just the time when the external air should enter and annul the expulsive movement, whereas it is the opposite that occurs. For when the breath is not let out and the heat accumulates too much then we need to respire, and to respire we must draw in

the breath. When hot, people breathe rapidly, because they must do so in order to cool themselves, just when the theory of Democritus would make them add fire to fire.

11

The theory found in the Timaeus, of the passing round of the breath by pushing, by no means determines how, in the case of the animals other than land-animals, their heat is preserved, and whether it is due to the same or a different cause. For if respiration occurs only in land-animals we should be told what is the reason of that. Likewise, if it is found in others also, but in a different form, this form of respiration, if they all can breathe, must also be described.

Further, the method of explaining involves a fiction. It is said that when the hot air issues from the mouth it pushes the surrounding air, which being carried on enters the very place whence the internal warmth issued, through the interstices of the porous flesh; and this reciprocal replacement is due to the fact that a vacuum cannot exist. But when it has become hot the air passes out again by the same route, and pushes back inwards through the mouth the air that had been discharged in a warm condition. It is said that it is this action which goes on continuously when the breath is taken in and let out.

But according to this way of thinking it will follow that we breathe out before we breathe in. But the opposite is the case, as evidence shows, for though these two functions go on in alternation, yet the last act when life comes to a close is the letting out of the breath, and hence its admission must have been the beginning of the process.

Once more, those who give this kind of explanation by no means state the final cause of the presence in animals of this function (to wit the admission and emission of the breath), but treat it as though it were a contingent accompaniment of life. Yet it evidently has control over life and death, for it results synchronously that when respiring animals are unable to breathe they perish. Again, it is absurd that the passage of the hot air out through the mouth and back again should be quite perceptible, while we were not able to detect the thoracic influx and the return outwards once more of the heated breath. It is also nonsense that respiration should consist in the entrance of heat, for the evidence is to the contrary effect; what is breathed out is hot, and what is breathed in is cold. When it is hot we pant in breathing, for, because what enters does not adequately perform its cooling function, we have as a consequence to draw the breath frequently.

12

It is certain, however, that we must not entertain the notion that it is for purposes of nutrition that respiration is designed, and believe that the internal fire is fed by the breath; respiration, as it were, adding fuel to the fire, while the feeding of the flame results in the outward passage of the breath. To combat this doctrine I shall repeat what I said in opposition to the previous theories. This, or something analogous to it, should occur in the other animals also (on this theory), for all possess vital heat. Further, how are we to describe this fictitious process of the generation of heat from the breath? Observation shows rather that it is a product of the food. A consequence also of this theory is that the nutriment would enter and the refuse be

discharged by the same channel, but this does not appear to occur in the other instances.

13

Empedocles also gives an account of respiration without, however, making clear what its purpose is, or whether or not it is universal in animals. Also when dealing with respiration by means of the nostrils he imagines he is dealing with what is the primary kind of respiration. Even the breath which passes through the nostrils passes through the windpipe out of the chest as well, and without the latter the nostrils cannot act. Again, when animals are bereft of respiration through the nostrils, no detrimental result ensues, but, when prevented from breathing through the windpipe, they die. Nature employs respiration through the nostrils as a secondary function in certain animals in order to enable them to smell. But the reason why it exists in some only is that though almost all animals are endowed with the sense of smell, the sense-organ is not the same in all.

A more precise account has been given about this elsewhere. Empedocles, however, explains the passage inwards and outwards of the breath, by the theory that there are certain blood-vessels, which, while containing blood, are not filled by it, but have passages leading to the outer air, the calibre of which is fine in contrast to the size of the solid particles, but large relatively to those in the air. Hence, since it is the nature of the blood to move upwards and downwards, when it moves down the air rushes in and inspiration occurs; when the blood rises, the air is forced out and the outward motion of the breath results. He compares this process to what occurs in a clepsydra.

Thus all things outwards breathe and in; – their flesh has tubes
Bloodless, that stretch towards the body's outmost edge,
Which, at their mouths, full many frequent channels pierce,
Cleaving the extreme nostrils through; thus, while the gore
Lies hid, for air is cut a thoroughfare most plain.
And thence, whenever shrinks away the tender blood,
Enters the blustering wind with swelling billow wild.
But when the blood leaps up, backward it breathes. As when
With water-clock of polished bronze a maiden sporting,
Sets on her comely hand the narrow of the tube
And dips it in the frail-formed water's silvery sheen;
Not then the flood the vessel enters, but the air,
Until she frees the crowded stream. But then indeed
Upon the escape runs in the water meet.
So also when within the vessel's deeps the water
Remains, the opening by the hand of flesh being closed,
The outer air that entrance craves restrains the flood
At the gates of the sounding narrow,
upon the surface pressing,
Until the maid withdraws her hand. But then in contrariwise
Once more the air comes in and water meet flows out.

Thus to the to the subtle blood, surging throughout the limbs,

Whene’er it shrinks away into the far recesses

Admits a stream of air rushing with swelling wave,

But, when it backward leaps, in like bulk air flows out.

This then is what he says of respiration. But, as we said, all animals that evidently respire do so by means of the windpipe, when they breathe either through the mouth or through the nostrils. Hence, if it is of this kind of respiration that he is talking, we must ask how it tallies with the explanation given. But the facts seem to be quite opposed. The chest is raised in the manner of a forge-bellows when the breath is drawn in – it is quite reasonable that it should be heat which raises up and that the blood should occupy the hot region – but it collapses and sinks down, like the bellows once more, when the breath is let out. The difference is that in a bellows it is not by the same channel that the air is taken in and let out, but in breathing it is.

But, if Empedocles is accounting only for respiration through the nostrils, he is much in error, for that does not involve the nostrils alone, but passes by the channel beside the uvula where the extremity of the roof of the mouth is, some of the air going this way through the apertures of the nostrils and some through the mouth, both when it enters and when it passes out. Such then is the nature and magnitude of the difficulties besetting the theories of other writers concerning respiration.

14

We have already stated that life and the presence of soul involve a certain heat. Not even the digesting process to which

is due the nutrition of animals occurs apart from soul and warmth, for it is to fire that in all cases elaboration is due. It is for this reason, precisely, that the primary nutritive soul also must be located in that part of the body and in that division of this region which is the immediate vehicle of this principle. The region in question is intermediate between that where food enters and that where excrement is discharged. In bloodless animals it has no name, but in the sanguineous class this organ is called the heart. The blood constitutes the nutriment from which the organs of the animal are directly formed. Likewise the bloodvessels must have the same originating source, since the one exists for the other's behoof – as a vessel or receptacle for it. In sanguineous animals the heart is the starting-point of the veins; they do not traverse it, but are found to stretch out from it, as dissections enable us to see.

Now the other psychical faculties cannot exist apart from the power of nutrition (the reason has already been stated in the treatise On the Soul), and this depends on the natural fire, by the union with which Nature has set it aglow. But fire, as we have already stated, is destroyed in two ways, either by extinction or by exhaustion. It suffers extinction from its opposites. Hence it can be extinguished by the surrounding cold both when in mass and (though more speedily) when scattered. Now this way of perishing is due to violence equally in living and in lifeless objects, for the division of an animal by instruments and consequent congelation by excess of cold cause death. But exhaustion is due to excess of heat; if there is too much heat close at hand and the thing burning does not have a fresh supply of fuel added to it, it goes out by exhaustion, not by the action of cold. Hence, if it is going to continue it must be cooled, for cold is a preventive against this form of extinction.

15

Some animals occupy the water, others live on land, and, that being so, in the case of those which are very small and bloodless the refrigeration due to the surrounding water or air is sufficient to prevent destruction from this cause. Having little heat, they require little cold to combat it. Hence too such animals are almost all short-lived, for, being small, they have less scope for deflection towards either extreme. But some insects are longer-lived though bloodless, like all the others), and these have a deep indentation beneath the waist, in order to secure cooling through the membrane, which there is thinner. They are warmer animals and hence require more refrigeration, and such are bees (some of which live as long as seven years) and all that make a humming noise, like wasps, cockchafers, and crickets. They make a sound as if of panting by means of air, for, in the middle section itself, the air which exists internally and is involved in their construction, causing a rising and falling movement, produces friction against the membrane. The way in which they move this region is like the motion due to the lungs in animals that breathe the outer air, or to the gills in fishes. What occurs is comparable to the suffocation of a respiring animal by holding its mouth, for then the lung causes a heaving motion of this kind. In the case of these animals this internal motion is not sufficient for refrigeration, but in insects it is. It is by friction against the membrane that they produce the humming sound, as we said, in the way that children do by blowing through the holes of a reed covered by a fine membrane. It is thus that the singing crickets too produce their song; they possess greater warmth and are indented at the waist, but the songless variety have no fissure there.

Animals also which are sanguineous and possess a lung, though that contains little blood and is spongy, can in some cases, owing to the latter fact, live a long time without breathing; for the lung, containing little blood or fluid, can rise a long way: its own motion can for a long time produce sufficient refrigeration. But at last it ceases to suffice, and the animal dies of suffocation if it does not respire – as we have already said. For of exhaustion that kind which is destruction due to lack of refrigeration is called suffocation, and whatsoever is thus destroyed is said to be suffocated.

We have already stated that among animals insects do not respire, and the fact is open to observation in the case of even small creatures like flies and bees, for they can swim about in a fluid for a long time if it is not too hot or too cold. Yet animals with little strength tend to breathe more frequently. These, however, die of what is called suffocation when the stomach becomes filled and the heat in the central segment is destroyed. This explains also why they revive after being among ashes for a time.

Again among water-animals those that are bloodless remain alive longer in air than those that have blood and admit the sea-water, as, for example, fishes. Since it is a small quantity of heat they possess, the air is for a long time adequate for the purposes of refrigeration in such animals as the crustacea and the polyps. It does not however suffice, owing to their want of heat, to keep them finally in life, for most fishes also live though among earth, yet in a motionless state, and are to be found by digging. For all animals that have no lung at all or have a bloodless one require less refrigeration.

16

Concerning the bloodless animals we have declared that in some cases it is the surrounding air, in others fluid, that aids the maintenance of life. But in the case of animals possessing blood and heart, all which have a lung admit the air and produce the cooling effect by breathing in and out. All animals have a lung that are viviparous and are so internally, not externally merely (the Selachia are viviparous, but not internally), and of the oviparous class those that have wings, e.g. birds, and those with scales, e.g. tortoises, lizards, and snakes. The former class have a lung charged with blood, but in the most part of the latter it is spongy. Hence they employ respiration more sparingly as already said. The function is found also in all that frequent and pass their life in the water, e.g. the class of water-snakes and frogs and crocodiles and hemydes, both sea – and land-tortoises, and seals.

All these and similar animals both bring forth on land and sleep on shore or, when they do so in the water, keep the head above the surface in order to respire. But all with gills produce refrigeration by taking in water; the Selachia and all other footless animals have gills. Fish are footless, and the limbs they have get their name (pterugion) from their similarity to wings (pterux). But of those with feet one only, so far as observed, has gills. It is called the tadpole.

No animal yet has been seen to possess both lungs and gills, and the reason for this is that the lung is designed for the purpose of refrigeration by means of the air (it seems to have derived its name (pneumon) from its function as a receptacle of the breath (pneuma)), while gills are relevant to refrigeration by water. Now for one purpose one organ is adapted and one single means of refrigeration is sufficient in every case. Hence, since we see that Nature does nothing in vain, and if there were two

organs one would be purposeless, this is the reason why some animals have gills, others lungs, but none possess both.

17

Every animal in order to exist requires nutriment, in order to prevent itself from dying, refrigeration; and so Nature employs the same organ for both purposes. For, as in some cases the tongue serves both for discerning tastes and for speech, so in animals with lungs the mouth is employed both in working up the food and in the passage of the breath outwards and inwards. In lungless and non-respiring animals it is employed in working up the food, while in those of them that require refrigeration it is the gills that are created for this purpose.

We shall state further on how it is that these organs have the faculty of producing refrigeration. But to prevent their food from impeding these operations there is a similar contrivance in the respiring animals and in those that admit water. At the moment of respiration they do not take in food, for otherwise suffocation results owing to the food, whether liquid or dry, slipping in through the windpipe and lying on the lung. The windpipe is situated before the oesophagus, through which food passes into what is called the stomach, but in quadrupeds which are sanguineous there is, as it were, a lid over the windpipe – the epiglottis. In birds and oviparous quadrupeds this covering is absent, but its office is discharged by a contraction of the windpipe. The latter class contract the windpipe when swallowing their food; the former close down the epiglottis. When the food has passed, the epiglottis is in the one case raised, and in the other the windpipe is expanded, and the air enters to effect refrigeration. In animals with gills the water is

first discharged through them and then the food passes in through the mouth; they have no windpipe and hence can take no harm from liquid lodging in this organ, only from its entering the stomach. For these reasons the expulsion of water and the seizing of their food is rapid, and their teeth are sharp and in almost all cases arranged in a saw-like fashion, for they are debarred from chewing their food.

18

Among water-animals the cetaceans may give rise to some perplexity, though they too can be rationally explained.

Examples of such animals are dolphins and whales, and all others that have a blowhole. They have no feet, yet possess a lung though admitting the sea-water. The reason for possessing a lung is that which we have now stated [refrigeration]; the admission of water is not for the purpose of refrigeration. That is effected by respiration, for they have a lung. Hence they sleep with their head out of the water, and dolphins, at any rate, snore. Further, if they are entangled in nets they soon die of suffocation owing to lack of respiration, and hence they can be seen to come to the surface owing to the necessity of breathing. But, since they have to feed in the water, they must admit it, and it is in order to discharge this that they all have a blowhole; after admitting the water they expel it through the blowhole as the fishes do through the gills. The position of the blowhole is an indication of this, for it leads to none of the organs which are charged with blood; but it lies before the brain and thence discharges water.

It is for the very same reason that molluscs and crustaceans admit water – I mean such animals as Carabi and Carcini. For

none of these is refrigeration a necessity, for in every case they have little heat and are bloodless, and hence are sufficiently cooled by the surrounding water. But in feeding they admit water, and hence must expel it in order to prevent its being swallowed simultaneously with the food. Thus crustaceans, like the Carcini and Carabi, discharge water through the folds beside their shaggy parts, while cuttlefish and the polyps employ for this purpose the hollow above the head. There is, however, a more precise account of these in the History of Animals.

Thus it has been explained that the cause of the admission of the water is refrigeration, and the fact that animals constituted for a life in water must feed in it.

19

An account must next be given of refrigeration and the manner in which it occurs in respiring animals and those possessed of gills. We have already said that all animals with lungs respire. The reason why some creatures have this organ, and why those having it need respiration, is that the higher animals have a greater proportion of heat, for at the same time they must have been assigned a higher soul and they have a higher nature than plants. Hence too those with most blood and most warmth in the lung are of greater size, and animal in which the blood in the lung is purest and most plentiful is the most erect, namely man; and the reason why he alone has his upper part directed to the upper part of the universe is that he possesses such a lung. Hence this organ as much as any other must be assigned to the essence of the animal both in man and in other cases.

This then is the purpose of refrigeration. As for the constraining and efficient cause, we must believe that it created animals like

this, just as it created many others also not of this constitution. For some have a greater proportion of earth in their composition, like plants, and others, e.g. aquatic animals, contain a larger amount of water; while winged and terrestrial animals have an excess of air and fire respectively. It is always in the region proper to the element preponderating in the scheme of their constitution that things exist.

20

Empedocles is then in error when he says that those animals which have the most warmth and fire live in the water to counterbalance the excess of heat in their constitution, in order that, since they are deficient in cold and fluid, they may be kept in life by the contrary character of the region they occupy; for water has less heat than air. But it is wholly absurd that the water-animals should in every case originate on dry land, and afterwards change their place of abode to the water; for they are almost all footless. He, however, when describing their original structure says that, though originating on dry land, they have abandoned it and migrated to the water. But again it is evident that they are not warmer than land-animals, for in some cases they have no blood at all, in others little.

The question, however, as to what sorts of animals should be called warm and what cold, has in each special case received consideration. Though in one respect there is reason in the explanation which Empedocles aims at establishing, yet his account is not correct. Excess in a bodily state is cured by a situation or season of opposite character, but the constitution is best maintained by an environment akin to it. There is a difference between the material of which any animal is

constituted and the states and dispositions of that material. For example, if nature were to constitute a thing of wax or of ice, she would not preserve it by putting it in a hot place, for the opposing quality would quickly destroy it, seeing that heat dissolves that which cold congeals. Again, a thing composed of salt or nitre would not be taken and placed in water, for fluid dissolves that of which the consistency is due to the hot and the dry.

Hence if the fluid and the dry supply the material for all bodies, it is reasonable that things the composition of which is due to the fluid and the cold should have liquid for their medium [and, if they are cold, they will exist in the cold], while that which is due to the dry will be found in the dry. Thus trees grow not in water but on dry land. But the same theory would relegate them to the water, on account of their excess of dryness, just as it does the things that are excessively fiery. They would migrate thither not on account of its cold but owing to its fluidity.

Thus the natural character of the material of objects is of the same nature as the region in which they exist; the liquid is found in liquid, the dry on land, the warm in air. With regard, however, to states of body, a cold situation has, on the other hand, a beneficial effect on excess of heat, and a warm environment on excess of cold, for the region reduces to a mean the excess in the bodily condition. The regions appropriate to each material and the revolutions of the seasons which all experience supply the means which must be sought in order to correct such excesses; but, while states of the body can be opposed in character to the environment, the material of which it is composed can never be so. This, then, is a sufficient explanation of why it is not owing to the heat in their constitution that some animals are aquatic, others terrestrial, as Empedocles maintains, and of why some possess lungs and others do not.

21

The explanation of the admission of air and respiration in those animals in which a lung is found, and especially in those in which it is full of blood, is to be found in the fact that it is of a spongy nature and full of tubes, and that it is the most fully charged with blood of all the visceral organs. All animals with a full-blooded lung require rapid refrigeration because there is little scope for deviation from the normal amount of their vital fire; the air also must penetrate all through it on account of the large quantity of blood and heat it contains. But both these operations can be easily performed by air, for, being of a subtle nature, it penetrates everywhere and that rapidly, and so performs its cooling function; but water has the opposite characteristics.

The reason why animals with a full-blooded lung respire most is hence manifest; the more heat there is, the greater is the need for refrigeration, and at the same time breath can easily pass to the source of heat in the heart.

22

In order to understand the way in which the heart is connected with the lung by means of passages, we must consult both dissections and the account in the History of Animals. The universal cause of the need which the animal has for refrigeration, is the union of the soul with fire that takes place in the heart. Respiration is the means of effecting refrigeration,

of which those animals make use that possess a lung as well as a heart. But when they, as for example the fishes, which on account of their aquatic nature have no lung, possess the latter organ without the former, the cooling is effected through the gills by means of water. For ocular evidence as to how the heart is situated relatively to the gills we must employ dissections, and for precise details we must refer to Natural History. As a summarizing statement, however, and for present purposes, the following is the account of the matter.

It might appear that the heart has not the same position in terrestrial animals and fishes, but the position really is identical, for the apex of the heart is in the direction in which they incline their heads. But it is towards the mouth in fishes that the apex of the heart points, seeing that they do not incline their heads in the same direction as land-animals do. Now from the extremity of the heart a tube of a sinewy, arterial character runs to the centre where the gills all join. This then is the largest of those ducts, but on either side of the heart others also issue and run to the extremity of each gill, and by means of the ceaseless flow of water through the gills, effect the cooling which passes to the heart.

In similar fashion as the fish move their gills, respiring animals with rapid action raise and let fall the chest according as the breath is admitted or expelled. If air is limited in amount and unchanged they are suffocated, for either medium, owing to contact with the blood, rapidly becomes hot. The heat of the blood counteracts the refrigeration and, when respiring animals can no longer move the lung aquatic animals their gills, whether owing to discase or old age, their death ensues.

23

To be born and to die are common to all animals, but there are specifically diverse ways in which these phenomena occur; of destruction there are different types, though yet something is common to them all. There is violent death and again natural death, and the former occurs when the cause of death is external, the latter when it is internal, and involved from the beginning in the constitution of the organ, and not an affection derived from a foreign source. In the case of plants the name given to this is withering, in animals senility. Death and decay pertain to all things that are not imperfectly developed; to the imperfect also they may be ascribed in nearly the same but not an identical sense. Under the imperfect I class eggs and seeds of plants as they are before the root appears.

It is always to some lack of heat that death is due, and in perfect creatures the cause is its failure in the organ containing the source of the creature's essential nature. This member is situate, as has been said, at the junction of the upper and lower parts; in plants it is intermediate between the root and the stem, in sanguineous animals it is the heart, and in those that are bloodless the corresponding part of their body. But some of these animals have potentially many sources of life, though in actuality they possess only one. This is why some insects live when divided, and why, even among sanguineous animals, all whose vitality is not intense live for a long time after the heart has been removed. Tortoises, for example, do so and make movements with their feet, so long as the shell is left, a fact to be explained by the natural inferiority of their constitution, as it is in insects also.

The source of life is lost to its possessors when the heat with which it is bound up is no longer tempered by cooling, for, as I have often remarked, it is consumed by itself. Hence when,

owing to lapse of time, the lung in the one class and the gills in the other get dried up, these organs become hard and earthy and incapable of movement, and cannot be expanded or contracted. Finally things come to a climax, and the fire goes out from exhaustion.

Hence a small disturbance will speedily cause death in old age. Little heat remains, for the most of it has been breathed away in the long period of life preceding, and hence any increase of strain on the organ quickly causes extinction. It is just as though the heart contained a tiny feeble flame which the slightest movement puts out. Hence in old age death is painless, for no violent disturbance is required to cause death, and there is an entire absence of feeling when the soul's connexion is severed. All diseases which harden the lung by forming tumours or waste residues, or by excess of morbid heat, as happens in fevers, accelerate the breathing owing to the inability of the lung to move far either upwards or downwards. Finally, when motion is no longer possible, the breath is given out and death ensues.

24

Generation is the initial participation, mediated by warm substance, in the nutritive soul, and life is the maintenance of this participation. Youth is the period of the growth of the primary organ of refrigeration, old age of its decay, while the intervening time is the prime of life.

A violent death or dissolution consists in the extinction or exhaustion of the vital heat (for either of these may cause dissolution), while natural death is the exhaustion of the heat owing to lapse of time, and occurring at the end of life. In plants

this is to wither, in animals to die. Death, in old age, is the exhaustion due to inability on the part of the organ, owing to old age, to produce refrigeration. This then is our account of generation and life and death, and the reason for their occurrence in animals.

25

It is hence also clear why respiring animals are suffocated in water and fishes in air. For it is by water in the latter class, by air in the former that refrigeration is effected, and either of these means of performing the function is removed by a change of environment.

There is also to be explained in either case the cause of the cause of the motion of the gills and of the lungs, the rise and fall of which effects the admission and expulsion of the breath or of water. The following, moreover, is the manner of the constitution of the organ.

26

In connexion with the heart there are three phenomena, which, though apparently of the same nature, are really not so, namely palpitation, pulsation, and respiration.

Palpitation is the rushing together of the hot substance in the heart owing to the chilling influence of residual or waste products. It occurs, for example, in the ailment known as ‘spasms’ and in other diseases. It occurs also in fear, for when

one is afraid the upper parts become cold, and the hot substance, fleeing away, by its concentration in the heart produces palpitation. It is crushed into so small a space that sometimes life is extinguished, and the animals die of the fright and morbid disturbance.

The beating of the heart, which, as can be seen, goes on continuously, is similar to the throbbing of an abscess. That, however, is accompanied by pain, because the change produced in the blood is unnatural, and it goes on until the matter formed by concoction is discharged. There is a similarity between this phenomenon and that of boiling; for boiling is due to the volatilization of fluid by heat and the expansion consequent on increase of bulk. But in an abscess, if there is no evaporation through the walls, the process terminates in suppuration due to the thickening of the liquid, while in boiling it ends in the escape of the fluid out of the containing vessel.

In the heart the beating is produced by the heat expanding the fluid, of which the food furnishes a constant supply. It occurs when the fluid rises to the outer wall of the heart, and it goes on continuously; for there is a constant flow of the fluid that goes to constitute the blood, it being in the heart that the blood receives its primary elaboration. That this is so we can perceive in the initial stages of generation, for the heart can be seen to contain blood before the veins become distinct. This explains why pulsation in youth exceeds that in older people, for in the young the formation of vapour is more abundant.

All the veins pulse, and do so simultaneously with each other, owing to their connexion with the heart. The heart always beats, and hence they also beat continuously and simultaneously with each other and with it.

Palpitation, then, is the recoil of the heart against the compression due to cold; and pulsation is the volatilization of the heated fluid.

27

Respiration takes place when the hot substance which is the seat of the nutritive principle increases. For it, like the rest of the body, requires nutrition, and more so than the members, for it is through it that they are nourished. But when it increases it necessarily causes the organ to rise. This organ we must to be constructed like the bellows in a smithy, for both heart and lungs conform pretty well to this shape. Such a structure must be double, for the nutritive principle must be situated in the centre of the natural force.

Thus on increase of bulk expansion results, which necessarily causes the surrounding parts to rise. Now this can be seen to occur when people respire; they raise their chest because the motive principle of the organ described resident within the chest causes an identical expansion of this organ. When it dilates the outer air must rush in as into a bellows, and, being cold, by its chilling influence reduces by extinction the excess of the fire. But, as the increase of bulk causes the organ to dilate, so diminution causes contraction, and when it collapses the air which entered must pass out again. When it enters the air is cold, but on issuing it is warm owing to its contact with the heat resident in this organ, and this is specially the case in those animals that possess a full-blooded lung. The numerous canal-like ducts in the lung, into which it passes, have each a blood-vessel lying alongside, so that the whole lung is thought to be full of blood. The inward passage of the air is called respiration,

the outward expiration, and this double movement goes on continuously just so long as the animal lives and keeps this organ in continuous motion; it is for this reason that life is bound up with the passage of the breath outwards and inwards.

It is in the same way that the motion of the gills in fishes takes place. When the hot substance in the blood throughout the members rises, the gills rise too, and let the water pass through, but when it is chilled and retreats through its channels to the heart, they contract and eject the water. Continually as the heat in the heart rises, continually on being chilled it returns thither again. Hence, as in respiring animals life and death are bound up with respiration, so in the other animals class they depend on the admission of water.

Our discussion of life and death and kindred topics is now practically complete. But health and discase also claim the attention of the scientist, and not mercly of the physician, in so far as an account of their causes is concerned. The extent to which these two differ and investigate diverse provinces must not escape us, since facts show that their inquiries are, to a certain extent, at least conterminous. For physicians of culture and refinement make some mention of natural science, and claim to derive their principles from it, while the most accomplished investigators into nature generally push their studies so far as to conclude with an account of medical principles.

Aristotle - History of Animals

[Translated by D'Arcy Wentworth Thompson]

Book I

1

Of the parts of animals some are simple: to wit, all such as divide into parts uniform with themselves, as flesh into flesh; others are composite, such as divide into parts not uniform with themselves, as, for instance, the hand does not divide into hands nor the face into faces.

And of such as these, some are called not parts merely, but limbs or members. Such are those parts that, while entire in themselves, have within themselves other diverse parts: as for instance, the head, foot, hand, the arm as a whole, the chest; for these are all in themselves entire parts, and there are other diverse parts belonging to them.

All those parts that do not subdivide into parts uniform with themselves are composed of parts that do so subdivide, for instance, hand is composed of flesh, sinews, and bones. Of animals, some resemble one another in all their parts, while others have parts wherein they differ. Sometimes the parts are identical in form or species, as, for instance, one man's nose or eye resembles another man's nose or eye, flesh flesh, and bone bone; and in like manner with a horse, and with all other animals which we reckon to be of one and the same species: for as the whole is to the whole, so each to each are the parts

severally. In other cases the parts are identical, save only for a difference in the way of excess or defect, as is the case in such animals as are of one and the same genus. By 'genus' I mean, for instance, Bird or Fish, for each of these is subject to difference in respect of its genus, and there are many species of fishes and of birds.

Within the limits of genera, most of the parts as a rule exhibit differences through contrast of the property or accident, such as colour and shape, to which they are subject: in that some are more and some in a less degree the subject of the same property or accident; and also in the way of multitude or fewness, magnitude or parvitude, in short in the way of excess or defect. Thus in some the texture of the flesh is soft, in others firm; some have a long bill, others a short one; some have abundance of feathers, others have only a small quantity. It happens further that some have parts that others have not: for instance, some have spurs and others not, some have crests and others not; but as a general rule, most parts and those that go to make up the bulk of the body are either identical with one another, or differ from one another in the way of contrast and of excess and defect. For 'the more' and 'the less' may be represented as 'excess' or 'defect'.

Once again, we may have to do with animals whose parts are neither identical in form nor yet identical save for differences in the way of excess or defect: but they are the same only in the way of analogy, as, for instance, bone is only analogous to fish-bone, nail to hoof, hand to claw, and scale to feather; for what the feather is in a bird, the scale is in a fish.

The parts, then, which animals severally possess are diverse from, or identical with, one another in the fashion above described. And they are so furthermore in the way of local disposition: for many animals have identical organs that differ

in position; for instance, some have teats in the breast, others close to the thighs.

Of the substances that are composed of parts uniform (or homogeneous) with themselves, some are soft and moist, others are dry and solid. The soft and moist are such either absolutely or so long as they are in their natural conditions, as, for instance, blood, serum, lard, suet, marrow, sperm, gall, milk in such as have it flesh and the like; and also, in a different way, the superfluities, as phlegm and the excretions of the belly and the bladder. The dry and solid are such as sinew, skin, vein, hair, bone, gristle, nail, horn (a term which as applied to the part involves an ambiguity, since the whole also by virtue of its form is designated horn), and such parts as present an analogy to these.

Animals differ from one another in their modes of subsistence, in their actions, in their habits, and in their parts. Concerning these differences we shall first speak in broad and general terms, and subsequently we shall treat of the same with close reference to each particular genus.

Differences are manifested in modes of subsistence, in habits, in actions performed. For instance, some animals live in water and others on land. And of those that live in water some do so in one way, and some in another: that is to say, some live and feed in the water, take in and emit water, and cannot live if deprived of water, as is the case with the great majority of fishes; others get their food and spend their days in the water, but do not take in water but air, nor do they bring forth in the water. Many of these creatures are furnished with feet, as the otter, the beaver, and the crocodile; some are furnished with wings, as the diver and the grebe; some are destitute of feet, as the water-snake. Some creatures get their living in the water and cannot exist outside it: but for all that do not take in either

air or water, as, for instance, the sea-nettle and the oyster. And of creatures that live in the water some live in the sea, some in rivers, some in lakes, and some in marshes, as the frog and the newt.

Of animals that live on dry land some take in air and emit it, which phenomena are termed ‘inhalation’ and ‘exhalation’; as, for instance, man and all such land animals as are furnished with lungs. Others, again, do not inhale air, yet live and find their sustenance on dry land; as, for instance, the wasp, the bee, and all other insects. And by ‘insects’ I mean such creatures as have nicks or notches on their bodies, either on their bellies or on both backs and bellies.

And of land animals many, as has been said, derive their subsistence from the water; but of creatures that live in and inhale water not a single one derives its subsistence from dry land.

Some animals at first live in water, and by and by change their shape and live out of water, as is the case with river worms, for out of these the gadfly develops.

Furthermore, some animals are stationary, and some are erratic. Stationary animals are found in water, but no such creature is found on dry land. In the water are many creatures that live in close adhesion to an external object, as is the case with several kinds of oyster. And, by the way, the sponge appears to be endowed with a certain sensibility: as a proof of which it is alleged that the difficulty in detaching it from its moorings is increased if the movement to detach it be not covertly applied.

Other creatures adhere at one time to an object and detach themselves from it at other times, as is the case with a species of the so-called sea-nettle; for some of these creatures seek their food in the night-time loose and unattached.

Many creatures are unattached but motionless, as is the case with oysters and the so-called holothuria. Some can swim, as, for instance, fishes, molluscs, and crustaceans, such as the crawfish. But some of these last move by walking, as the crab, for it is the nature of the creature, though it lives in water, to move by walking.

Of land animals some are furnished with wings, such as birds and bees, and these are so furnished in different ways one from another; others are furnished with feet. Of the animals that are furnished with feet some walk, some creep, and some wriggle. But no creature is able only to move by flying, as the fish is able only to swim, for the animals with leathern wings can walk; the bat has feet and the seal has imperfect feet.

Some birds have feet of little power, and are therefore called Apodes. This little bird is powerful on the wing; and, as a rule, birds that resemble it are weak-footed and strong winged, such as the swallow and the drepanis or (?) Alpine swift; for all these birds resemble one another in their habits and in their plumage, and may easily be mistaken one for another. (The apus is to be seen at all seasons, but the drepanis only after rainy weather in summer; for this is the time when it is seen and captured, though, as a general rule, it is a rare bird.)

Again, some animals move by walking on the ground as well as by swimming in water.

Furthermore, the following differences are manifest in their modes of living and in their actions. Some are gregarious, some are solitary, whether they be furnished with feet or wings or be fitted for a life in the water; and some partake of both characters, the solitary and the gregarious. And of the gregarious, some are disposed to combine for social purposes, others to live each for its own self.

Gregarious creatures are, among birds, such as the pigeon, the crane, and the swan; and, by the way, no bird furnished with crooked talons is gregarious. Of creatures that live in water many kinds of fishes are gregarious, such as the so-called migrants, the tunny, the pelamys, and the bonito.

Man, by the way, presents a mixture of the two characters, the gregarious and the solitary.

Social creatures are such as have some one common object in view; and this property is not common to all creatures that are gregarious. Such social creatures are man, the bee, the wasp, the ant, and the crane.

Again, of these social creatures some submit to a ruler, others are subject to no governance: as, for instance, the crane and the several sorts of bee submit to a ruler, whereas ants and numerous other creatures are every one his own master.

And again, both of gregarious and of solitary animals, some are attached to a fixed home and others are erratic or nomad.

Also, some are carnivorous, some graminivorous, some omnivorous: whilst some feed on a peculiar diet, as for instance the bees and the spiders, for the bee lives on honey and certain other sweets, and the spider lives by catching flies; and some creatures live on fish. Again, some creatures catch their food, others treasure it up; whereas others do not so.

Some creatures provide themselves with a dwelling, others go without one: of the former kind are the mole, the mouse, the ant, the bee; of the latter kind are many insects and quadrupeds. Further, in respect to locality of dwelling place, some creatures dwell under ground, as the lizard and the snake; others live on the surface of the ground, as the horse and the dog. make to themselves holes, others do not

Some are nocturnal, as the owl and the bat; others live in the daylight.

Moreover, some creatures are tame and some are wild: some are at all times tame, as man and the mule; others are at all times savage, as the leopard and the wolf; and some creatures can be rapidly tamed, as the elephant.

Again, we may regard animals in another light. For, whenever a race of animals is found domesticated, the same is always to be found in a wild condition; as we find to be the case with horses, kine, swine, (men), sheep, goats, and dogs.

Further, some animals emit sound while others are mute, and some are endowed with voice: of these latter some have articulate speech, while others are inarticulate; some are given to continual chirping and twittering some are prone to silence; some are musical, and some unmusical; but all animals without exception exercise their power of singing or chattering chiefly in connexion with the intercourse of the sexes.

Again, some creatures live in the fields, as the cushat; some on the mountains, as the hoopoe; some frequent the abodes of men, as the pigeon.

Some, again, are peculiarly salacious, as the partridge, the barn-door cock and their congeners; others are inclined to chastity, as the whole tribe of crows, for birds of this kind indulge but rarely in sexual intercourse.

Of marine animals, again, some live in the open seas, some near the shore, some on rocks.

Furthermore, some are combative under offence; others are provident for defence. Of the former kind are such as act as aggressors upon others or retaliate when subjected to ill usage,

and of the latter kind are such as merely have some means of guarding themselves against attack.

Animals also differ from one another in regard to character in the following respects. Some are good-tempered, sluggish, and little prone to ferocity, as the ox; others are quick tempered, ferocious and unteachable, as the wild boar; some are intelligent and timid, as the stag and the hare; others are mean and treacherous, as the snake; others are noble and courageous and high-bred, as the lion; others are thorough-bred and wild and treacherous, as the wolf: for, by the way, an animal is highbred if it come from a noble stock, and an animal is thorough-bred if it does not deflect from its racial characteristics.

Further, some are crafty and mischievous, as the fox; some are spirited and affectionate and fawning, as the dog; others are easy-tempered and easily domesticated, as the elephant; others are cautious and watchful, as the goose; others are jealous and self-conceited, as the peacock. But of all animals man alone is capable of deliberation.

Many animals have memory, and are capable of instruction; but no other creature except man can recall the past at will.

With regard to the several genera of animals, particulars as to their habits of life and modes of existence will be discussed more fully by and by.

2

Common to all animals are the organs whereby they take food and the organs where into they take it; and these are either

identical with one another, or are diverse in the ways above specified: to wit, either identical in form, or varying in respect of excess or defect, or resembling one another analogically, or differing in position.

Furthermore, the great majority of animals have other organs besides these in common, whereby they discharge the residuum of their food: I say, the great majority, for this statement does not apply to all. And, by the way, the organ whereby food is taken in is called the mouth, and the organ whereinto it is taken, the belly; the remainder of the alimentary system has a great variety of names.

Now the residuum of food is twofold in kind, wet and dry, and such creatures as have organs receptive of wet residuum are invariably found with organs receptive of dry residuum; but such as have organs receptive of dry residuum need not possess organs receptive of wet residuum. In other words, an animal has a bowel or intestine if it have a bladder; but an animal may have a bowel and be without a bladder. And, by the way, I may here remark that the organ receptive of wet residuum is termed 'bladder', and the organ receptive of dry residuum 'intestine or 'bowel'.

3

Of animals otherwise, a great many have, besides the organs above-mentioned, an organ for excretion of the sperm: and of animals capable of generation one secretes into another, and the other into itself. The latter is termed 'female', and the former 'male'; but some animals have neither male nor female. Consequently, the organs connected with this function differ in

form, for some animals have a womb and others an organ analogous thereto.

The above-mentioned organs, then, are the most indispensable parts of animals; and with some of them all animals without exception, and with others animals for the most part, must needs be provided.

One sense, and one alone, is common to all animals – the sense of touch. Consequently, there is no special name for the organ in which it has its seat; for in some groups of animals the organ is identical, in others it is only analogous.

4

Every animal is supplied with moisture, and, if the animal be deprived of the same by natural causes or artificial means, death ensues: further, every animal has another part in which the moisture is contained. These parts are blood and vein, and in other animals there is something to correspond; but in these latter the parts are imperfect, being merely fibre and serum or lymph.

Touch has its seat in a part uniform and homogeneous, as in the flesh or something of the kind, and generally, with animals supplied with blood, in the parts charged with blood. In other animals it has its seat in parts analogous to the parts charged with blood; but in all cases it is seated in parts that in their texture are homogeneous.

The active faculties, on the contrary, are seated in the parts that are heterogeneous: as, for instance, the business of preparing

the food is seated in the mouth, and the office of locomotion in the feet, the wings, or in organs to correspond.

Again, some animals are supplied with blood, as man, the horse, and all such animals as are, when full-grown, either destitute of feet, or two-footed, or four-footed; other animals are bloodless, such as the bee and the wasp, and, of marine animals, the cuttle-fish, the crawfish, and all such animals as have more than four feet.

5

Again, some animals are viviparous, others oviparous, others vermiparous or 'grub-bearing'. Some are viviparous, such as man, the horse, the seal, and all other animals that are hair-coated, and, of marine animals, the cetaceans, as the dolphin, and the so-called Selachia. (Of these latter animals, some have a tubular air-passage and no gills, as the dolphin and the whale: the dolphin with the air-passage going through its back, the whale with the air-passage in its forehead; others have uncovered gills, as the Selachia, the sharks and rays.)

What we term an egg is a certain completed result of conception out of which the animal that is to be develops, and in such a way that in respect to its primitive germ it comes from part only of the egg, while the rest serves for food as the germ develops. A 'grub' on the other hand is a thing out of which in its entirety the animal in its entirety develops, by differentiation and growth of the embryo.

Of viviparous animals, some hatch eggs in their own interior, as creatures of the shark kind; others engender in their interior a live foetus, as man and the horse. When the result of

conception is perfected, with some animals a living creature is brought forth, with others an egg is brought to light, with others a grub. Of the eggs, some have egg-shells and are of two different colours within, such as birds' eggs; others are soft-skinned and of uniform colour, as the eggs of animals of the shark kind. Of the grubs, some are from the first capable of movement, others are motionless. However, with regard to these phenomena we shall speak precisely hereafter when we come to treat of Generation.

Furthermore, some animals have feet and some are destitute thereof. Of such as have feet some animals have two, as is the case with men and birds, and with men and birds only; some have four, as the lizard and the dog; some have more, as the centipede and the bee; but allsoever that have feet have an even number of them.

Of swimming creatures that are destitute of feet, some have winglets or fins, as fishes: and of these some have four fins, two above on the back, two below on the belly, as the gilthead and the basse; some have two only, to wit, such as are exceedingly long and smooth, as the eel and the conger; some have none at all, as the muraena, but use the sea just as snakes use dry ground – and by the way, snakes swim in water in just the same way. Of the shark-kind some have no fins, such as those that are flat and long-tailed, as the ray and the sting-ray, but these fishes swim actually by the undulatory motion of their flat bodies; the fishing frog, however, has fins, and so likewise have all such fishes as have not their flat surfaces thinned off to a sharp edge.

Of those swimming creatures that appear to have feet, as is the case with the molluscs, these creatures swim by the aid of their feet and their fins as well, and they swim most rapidly backwards in the direction of the trunk, as is the case with the

cuttle-fish or sepia and the calamary; and, by the way, neither of these latter can walk as the poulpe or octopus can.

The hard-skinned or crustaceous animals, like the crawfish, swim by the instrumentality of their tail-parts; and they swim most rapidly tail foremost, by the aid of the fins developed upon that member. The newt swims by means of its feet and tail; and its tail resembles that of the sheatfish, to compare little with great.

Of animals that can fly some are furnished with feathered wings, as the eagle and the hawk; some are furnished with membranous wings, as the bee and the cockchafer; others are furnished with leathern wings, as the flying fox and the bat. All flying creatures possessed of blood have feathered wings or leathern wings; the bloodless creatures have membranous wings, as insects. The creatures that have feathered wings or leathern wings have either two feet or no feet at all: for there are said to be certain flying serpents in Ethiopia that are destitute of feet.

Creatures that have feathered wings are classed as a genus under the name of 'bird'; the other two genera, the leathern-winged and membrane-winged, are as yet without a generic title.

Of creatures that can fly and are bloodless some are coleopterous or sheath-winged, for they have their wings in a sheath or shard, like the cockchafer and the dung-beetle; others are sheathless, and of these latter some are dipterous and some tetrapterous: tetrapterous, such as are comparatively large or have their stings in the tail, dipterous, such as are comparatively small or have their stings in front. The coleoptera are, without exception, devoid of stings; the diptera have the sting in front, as the fly, the horsefly, the gadfly, and the gnat.

Bloodless animals as a general rule are inferior in point of size to blooded animals; though, by the way, there are found in the sea some few bloodless creatures of abnormal size, as in the case of certain molluscs. And of these bloodless genera, those are the largest that dwell in milder climates, and those that inhabit the sea are larger than those living on dry land or in fresh water.

All creatures that are capable of motion move with four or more points of motion; the blooded animals with four only: as, for instance, man with two hands and two feet, birds with two wings and two feet, quadrupeds and fishes severally with four feet and four fins. Creatures that have two winglets or fins, or that have none at all like serpents, move all the same with not less than four points of motion; for there are four bends in their bodies as they move, or two bends together with their fins. Bloodless and many footed animals, whether furnished with wings or feet, move with more than four points of motion; as, for instance, the dayfly moves with four feet and four wings: and, I may observe in passing, this creature is exceptional not only in regard to the duration of its existence, whence it receives its name, but also because though a quadruped it has wings also.

All animals move alike, four-footed and many-footed; in other words, they all move cross-corner-wise. And animals in general have two feet in advance; the crab alone has four.

6

Very extensive genera of animals, into which other subdivisions fall, are the following: one, of birds; one, of fishes; and another, of cetaceans. Now all these creatures are blooded.

There is another genus of the hard-shell kind, which is called oyster; another of the soft-shell kind, not as yet designated by a single term, such as the spiny crawfish and the various kinds of crabs and lobsters; and another of molluscs, as the two kinds of calamary and the cuttle-fish; that of insects is different. All these latter creatures are bloodless, and such of them as have feet have a goodly number of them; and of the insects some have wings as well as feet.

Of the other animals the genera are not extensive. For in them one species does not comprehend many species; but in one case, as man, the species is simple, admitting of no differentiation, while other cases admit of differentiation, but the forms lack particular designations.

So, for instance, creatures that are qudapedal and unprovided with wings are blooded without exception, but some of them are viviparous, and some oviparous. Such as are viviparous are hair-coated, and such as are oviparous are covered with a kind of tessellated hard substance; and the tessellated bits of this substance are, as it were, similar in regard to position to a scale.

An animal that is blooded and capable of movement on dry land, but is naturally unprovided with feet, belongs to the serpent genus; and animals of this genus are coated with the tessellated horny substance. Serpents in general are oviparous; the adder, an exceptional case, is viviparous: for not all viviparous animals are hair-coated, and some fishes also are viviparous.

All animals, however, that are hair-coated are viviparous. For, by the way, one must regard as a kind of hair such prickly hairs as hedgehogs and porcupines carry; for these spines perform the office of hair, and not of feet as is the case with similar parts of sea-urchins.

In the genus that combines all viviparous quadrupeds are many species, but under no common appellation. They are only named as it were one by one, as we say man, lion, stag, horse, dog, and so on; though, by the way, there is a sort of genus that embraces all creatures that have bushy manes and bushy tails, such as the horse, the ass, the mule, the jennet, and the animals that are called Hemioni in Syria, from their externally resembling mules, though they are not strictly of the same species. And that they are not so is proved by the fact that they mate with and breed from one another. For all these reasons, we must take animals species by species, and discuss their peculiarities severally.

These preceding statements, then, have been put forward thus in a general way, as a kind of foretaste of the number of subjects and of the properties that we have to consider in order that we may first get a clear notion of distinctive character and common properties. By and by we shall discuss these matters with greater minuteness.

After this we shall pass on to the discussion of causes. For to do this when the investigation of the details is complete is the proper and natural method, and that whereby the subjects and the premisses of our argument will afterwards be rendered plain.

In the first place we must look to the constituent parts of animals. For it is in a way relative to these parts, first and foremost, that animals in their entirety differ from one another: either in the fact that some have this or that, while they have not that or this; or by peculiarities of position or of arrangement; or by the differences that have been previously mentioned, depending upon diversity of form, or excess or defect in this or that particular, on analogy, or on contrasts of the accidental qualities.

To begin with, we must take into consideration the parts of Man. For, just as each nation is wont to reckon by that monetary standard with which it is most familiar, so must we do in other matters. And, of course, man is the animal with which we are all of us the most familiar.

Now the parts are obvious enough to physical perception. However, with the view of observing due order and sequence and of combining rational notions with physical perception, we shall proceed to enumerate the parts: firstly, the organic, and afterwards the simple or non-composite.

7

The chief parts into which the body as a whole is subdivided, are the head, the neck, the trunk (extending from the neck to the privy parts), which is called the thorax, two arms and two legs.

Of the parts of which the head is composed the hair-covered portion is called the 'skull'. The front portion of it is termed 'bregma' or 'sinciput', developed after birth – for it is the last of all the bones in the body to acquire solidity, – the hinder part is termed the 'occiput', and the part intervening between the sinciput and the occiput is the 'crown'. The brain lies underneath the sinciput; the occiput is hollow. The skull consists entirely of thin bone, rounded in shape, and contained within a wrapper of fleshless skin.

The skull has sutures: one, of circular form, in the case of women; in the case of men, as a general rule, three meeting at a point. Instances have been known of a man's skull devoid of suture altogether. In the skull the middle line, where the hair

parts, is called the crown or vertex. In some cases the parting is double; that is to say, some men are double crowned, not in regard to the bony skull, but in consequence of the double fall or set of the hair.

8

The part that lies under the skull is called the ‘face’: but in the case of man only, for the term is not applied to a fish or to an ox. In the face the part below the sinciput and between the eyes is termed the forehead. When men have large foreheads, they are slow to move; when they have small ones, they are fickle; when they have broad ones, they are apt to be distraught; when they have foreheads rounded or bulging out, they are quick-tempered.

9

Underneath the forehead are two eyebrows. Straight eyebrows are a sign of softness of disposition; such as curve in towards the nose, of harshness; such as curve out towards the temples, of humour and dissimulation; such as are drawn in towards one another, of jealousy.

Under the eyebrows come the eyes. These are naturally two in number. Each of them has an upper and a lower eyelid, and the hairs on the edges of these are termed ‘eyelashes’. The central part of the eye includes the moist part whereby vision is effected, termed the ‘pupil’, and the part surrounding it called the ‘black’; the part outside this is the ‘white’. A part common to

the upper and lower eyelid is a pair of nicks or corners, one in the direction of the nose, and the other in the direction of the temples. When these are long they are a sign of bad disposition; if the side toward the nostril be fleshy and comb-like, they are a sign of dishonesty.

All animals, as a general rule, are provided with eyes, excepting the ostracoderms and other imperfect creatures; at all events, all viviparous animals have eyes, with the exception of the mole. And yet one might assert that, though the mole has not eyes in the full sense, yet it has eyes in a kind of a way. For in point of absolute fact it cannot see, and has no eyes visible externally; but when the outer skin is removed, it is found to have the place where eyes are usually situated, and the black parts of the eyes rightly situated, and all the place that is usually devoted on the outside to eyes: showing that the parts are stunted in development, and the skin allowed to grow over.

10

Of the eye the white is pretty much the same in all creatures; but what is called the black differs in various animals. Some have the rim black, some distinctly blue, some greyish-blue, some greenish; and this last colour is the sign of an excellent disposition, and is particularly well adapted for sharpness of vision. Man is the only, or nearly the only, creature, that has eyes of diverse colours. Animals, as a rule, have eyes of one colour only. Some horses have blue eyes.

Of eyes, some are large, some small, some medium-sized; of these, the medium-sized are the best. Moreover, eyes sometimes protrude, sometimes recede, sometimes are neither protruding nor receding. Of these, the receding eye is in all

animals the most acute; but the last kind are the sign of the best disposition. Again, eyes are sometimes inclined to wink under observation, sometimes to remain open and staring, and sometimes are disposed neither to wink nor stare. The last kind are the sign of the best nature, and of the others, the latter kind indicates impudence, and the former indecision.

11

Furthermore, there is a portion of the head, whereby an animal hears, a part incapable of breathing, the 'ear'. I say 'incapable of breathing', for Alcmaeon is mistaken when he says that goats inspire through their ears. Of the ear one part is unnamed, the other part is called the 'lobe'; and it is entirely composed of gristle and flesh. The ear is constructed internally like the trumpet-shell, and the innermost bone is like the ear itself, and into it at the end the sound makes its way, as into the bottom of a jar. This receptacle does not communicate by any passage with the brain, but does so with the palate, and a vein extends from the brain towards it. The eyes also are connected with the brain, and each of them lies at the end of a little vein. Of animals possessed of ears man is the only one that cannot move this organ. Of creatures possessed of hearing, some have ears, whilst others have none, but merely have the passages for ears visible, as, for example, feathered animals or animals coated with horny tessellates.

Viviparous animals, with the exception of the seal, the dolphin, and those others which after a similar fashion to these are cetaceans, are all provided with ears; for, by the way, the shark-kind are also viviparous. Now, the seal has the passages visible whereby it hears; but the dolphin can hear, but has no ears, nor

yet any passages visible. But man alone is unable to move his ears, and all other animals can move them. And the ears lie, with man, in the same horizontal plane with the eyes, and not in a plane above them as is the case with some quadrupeds. Of ears, some are fine, some are coarse, and some are of medium texture; the last kind are best for hearing, but they serve in no way to indicate character. Some ears are large, some small, some medium-sized; again, some stand out far, some lie in close and tight, and some take up a medium position; of these such as are of medium size and of medium position are indications of the best disposition, while the large and outstanding ones indicate a tendency to irrelevant talk or chattering. The part intercepted between the eye, the ear, and the crown is termed the 'temple'. Again, there is a part of the countenance that serves as a passage for the breath, the 'nose'. For a man inhales and exhales by this organ, and sneezing is effected by its means: which last is an outward rush of collected breath, and is the only mode of breath used as an omen and regarded as supernatural. Both inhalation and exhalation go right on from the nose towards the chest; and with the nostrils alone and separately it is impossible to inhale or exhale, owing to the fact that the inspiration and respiration take place from the chest along the windpipe, and not by any portion connected with the head; and indeed it is possible for a creature to live without using this process of nasal respiration.

Again, smelling takes place by means of the nose, – smelling, or the sensible discrimination of odour. And the nostril admits of easy motion, and is not, like the ear, intrinsically immovable. A part of it, composed of gristle, constitutes, a septum or partition, and part is an open passage; for the nostril consists of two separate channels. The nostril (or nose) of the elephant is long and strong, and the animal uses it like a hand; for by means of this organ it draws objects towards it, and takes hold of them,

and introduces its food into its mouth, whether liquid or dry food, and it is the only living creature that does so.

Furthermore, there are two jaws; the front part of them constitutes the chin, and the hinder part the cheek. All animals move the lower jaw, with the exception of the river crocodile; this creature moves the upper jaw only.

Next after the nose come two lips, composed of flesh, and facile of motion. The mouth lies inside the jaws and lips. Parts of the mouth are the roof or palate and the pharynx.

The part that is sensible of taste is the tongue. The sensation has its seat at the tip of the tongue; if the object to be tasted be placed on the flat surface of the organ, the taste is less sensibly experienced. The tongue is sensitive in all other ways wherein flesh in general is so: that is, it can appreciate hardness, or warmth and cold, in any part of it, just as it can appreciate taste. The tongue is sometimes broad, sometimes narrow, and sometimes of medium width; the last kind is the best and the clearest in its discrimination of taste. Moreover, the tongue is sometimes loosely hung, and sometimes fastened: as in the case of those who mumble and who lisp.

The tongue consists of flesh, soft and spongy, and the so-called 'epiglottis' is a part of this organ.

That part of the mouth that splits into two bits is called the 'tonsils'; that part that splits into many bits, the 'gums'. Both the tonsils and the gums are composed of flesh. In the gums are teeth, composed of bone.

Inside the mouth is another part, shaped like a bunch of grapes, a pillar streaked with veins. If this pillar gets relaxed and inflamed it is called 'uvula' or 'bunch of grapes', and it then has a tendency to bring about suffocation.

12

The neck is the part between the face and the trunk. Of this the front part is the larynx land the back part the ur The front part, composed of gristle, through which respiration and speech is effected, is termed the 'windpipe'; the part that is fleshy is the oesophagus, inside just in front of the chine. The part to the back of the neck is the epomis, or 'shoulder-point'.

These then are the parts to be met with before you come to the thorax.

To the trunk there is a front part and a back part. Next after the neck in the front part is the chest, with a pair of breasts. To each of the breasts is attached a teat or nipple, through which in the case of females the milk percolates; and the breast is of a spongy texture. Milk, by the way, is found at times in the male; but with the male the flesh of the breast is tough, with the female it is soft and porous.

13

Next after the thorax and in front comes the 'belly', and its root the 'navel'. Underneath this root the bilateral part is the 'flank': the undivided part below the navel, the 'abdomen', the extremity of which is the region of the 'pubes'; above the navel the 'hypochondrium'; the cavity common to the hypochondrium and the flank is the gut-cavity.

Serving as a brace girdle to the hinder parts is the pelvis, and hence it gets its name (osphus), for it is symmetrical (isophues) in appearance; of the fundament the part for resting on is termed the 'rump', and the part whereon the thigh pivots is termed the 'socket' (or acetabulum).

The 'womb' is a part peculiar to the female; and the 'penis' is peculiar to the male. This latter organ is external and situated at the extremity of the trunk; it is composed of two separate parts: of which the extreme part is fleshy, does not alter in size, and is called the glans; and round about it is a skin devoid of any specific title, which integument if it be cut asunder never grows together again, any more than does the jaw or the eyelid. And the connexion between the latter and the glans is called the frenum. The remaining part of the penis is composed of gristle; it is easily susceptible of enlargement; and it protrudes and recedes in the reverse directions to what is observable in the identical organ in cats. Underneath the penis are two 'testicles', and the integument of these is a skin that is termed the 'scrotum'.

Testicles are not identical with flesh, and are not altogether diverse from it. But by and by we shall treat in an exhaustive way regarding all such parts.

14

The privy part of the female is in character opposite to that of the male. In other words, the part under the pubes is hollow or receding, and not, like the male organ, protruding. Further, there is an 'urethra' outside the womb; which organ serves as a passage for the sperm of the male, and as an outlet for liquid excretion to both sexes).

The part common to the neck and chest is the ‘throat’; the ‘armpit’ is common to side, arm, and shoulder; and the ‘groin’ is common to thigh and abdomen. The part inside the thigh and buttocks is the ‘perineum’, and the part outside the thigh and buttocks is the ‘hypoglutis’.

The front parts of the trunk have now been enumerated.

The part behind the chest is termed the ‘back’.

15

Parts of the back are a pair of ‘shoulderblades’, the ‘back-bone’, and, underneath on a level with the belly in the trunk, the ‘loins’. Common to the upper and lower part of the trunk are the ‘ribs’, eight on either side, for as to the so-called seven-ribbed Ligyans we have not received any trustworthy evidence.

Man, then, has an upper and a lower part, a front and a back part, a right and a left side. Now the right and the left side are pretty well alike in their parts and identical throughout, except that the left side is the weaker of the two; but the back parts do not resemble the front ones, neither do the lower ones the upper: only that these upper and lower parts may be said to resemble one another thus far, that, if the face be plump or meagre, the abdomen is plump or meagre to correspond; and that the legs correspond to the arms, and where the upper arm is short the thigh is usually short also, and where the feet are small the hands are small correspondingly.

Of the limbs, one set, forming a pair, is ‘arms’. To the arm belong the ‘shoulder’, ‘upper-arm’, ‘elbow’, ‘fore-arm’, and ‘hand’. To the hand belong the ‘palm’, and the five ‘fingers’. The part of the

finger that bends is termed 'knuckle', the part that is inflexible is termed the 'phalanx'. The big finger or thumb is single-jointed, the other fingers are double jointed. The bending both of the arm and of the finger takes place from without inwards in all cases; and the arm bends at the elbow. The inner part of the hand is termed the palm', and is fleshy and divided by joints or lines: in the case of long-lived people by one or two extending right across, in the case of the short-lived by two, not so extending. The joint between hand and arm is termed the 'wrist'. The outside or back of the hand is sinewy, and has no specific designation.

There is another duplicate limb, the 'leg'. Of this limb the double-knobbed part is termed the 'thigh-bone', the sliding part of the 'kneecap', the double-boned part the 'leg'; the front part of this latter is termed the 'shin', and the part behind it the 'calf', wherein the flesh is sinewy and venous, in some cases drawn upwards towards the hollow behind the knee, as in the case of people with large hips, and in other cases drawn downwards. The lower extremity of the shin is the 'ankle', duplicate in either leg. The part of the limb that contains a multiplicity of bones is the 'foot'. The hinder part of the foot is the 'heel'; at the front of it the divided part consists of 'toes', five in number; the fleshy part underneath is the 'ball'; the upper part or back of the foot is sinewy and has no particular appellation; of the toe, one portion is the 'nail' and another the 'joint', and the nail is in all cases at the extremity; and toes are without exception single jointed. Men that have the inside or sole of the foot clumsy and not arched, that is, that walk resting on the entire under-surface of their feet, are prone to roguery. The joint common to thigh and shin is the 'knee'.

These, then, are the parts common to the male and the female sex. The relative position of the parts as to up and down, or to front and back, or to right and left, all this as regards externals

might safely be left to mere ordinary perception. But for all that, we must treat of them for the same reason as the one previously brought forward; that is to say, we must refer to them in order that a due and regular sequence may be observed in our exposition, and in order that by the enumeration of these obvious facts due attention may be subsequently given to those parts in men and other animals that are diverse in any way from one another.

In man, above all other animals, the terms 'upper' and 'lower' are used in harmony with their natural positions; for in him, upper and lower have the same meaning as when they are applied to the universe as a whole. In like manner the terms, 'in front', 'behind', 'right' and 'left', are used in accordance with their natural sense. But in regard to other animals, in some cases these distinctions do not exist, and in others they do so, but in a vague way. For instance, the head with all animals is up and above in respect to their bodies; but man alone, as has been said, has, in maturity, this part uppermost in respect to the material universe.

Next after the head comes the neck, and then the chest and the back: the one in front and the other behind. Next after these come the belly, the loins, the sexual parts, and the haunches; then the thigh and shin; and, lastly, the feet.

The legs bend frontwards, in the direction of actual progression, and frontwards also lies that part of the foot which is the most effective of motion, and the flexure of that part; but the heel lies at the back, and the anklebones lie laterally, earwise. The arms are situated to right and left, and bend inwards: so that the convexities formed by bent arms and legs are practically face to face with one another in the case of man.

As for the senses and for the organs of sensation, the eyes, the nostrils, and the tongue, all alike are situated frontwards; the

sense of hearing, and the organ of hearing, the ear, is situated sideways, on the same horizontal plane with the eyes. The eyes in man are, in proportion to his size, nearer to one another than in any other animal.

Of the senses man has the sense of touch more refined than any animal, and so also, but in less degree, the sense of taste; in the development of the other senses he is surpassed by a great number of animals.

16

The parts, then, that are externally visible are arranged in the way above stated, and as a rule have their special designations, and from use and wont are known familiarly to all; but this is not the case with the inner parts. For the fact is that the inner parts of man are to a very great extent unknown, and the consequence is that we must have recourse to an examination of the inner parts of other animals whose nature in any way resembles that of man.

In the first place then, the brain lies in the front part of the head. And this holds alike with all animals possessed of a brain; and all blooded animals are possessed thereof, and, by the way, molluscs as well. But, taking size for size of animal, the largest brain, and the moistest, is that of man. Two membranes enclose it: the stronger one near the bone of the skull; the inner one, round the brain itself, is finer. The brain in all cases is bilateral. Behind this, right at the back, comes what is termed the 'cerebellum', differing in form from the brain as we may both feel and see.

The back of the head is with all animals empty and hollow, whatever be its size in the different animals. For some creatures have big heads while the face below is small in proportion, as is the case with round-faced animals; some have little heads and long jaws, as is the case, without exception, among animals of the mane-and-tail species.

The brain in all animals is bloodless, devoid of veins, and naturally cold to the touch; in the great majority of animals it has a small hollow in its centre. The brain-caul around it is reticulated with veins; and this brain-caul is that skin-like membrane which closely surrounds the brain. Above the brain is the thinnest and weakest bone of the head, which is termed or 'sinciput'.

From the eye there go three ducts to the brain: the largest and the medium-sized to the cerebellum, the least to the brain itself; and the least is the one situated nearest to the nostril. The two largest ones, then, run side by side and do not meet; the medium-sized ones meet – and this is particularly visible in fishes, – for they lie nearer than the large ones to the brain; the smallest pair are the most widely separate from one another, and do not meet.

Inside the neck is what is termed the oesophagus (whose other name is derived oesophagus from its length and narrowness), and the windpipe. The windpipe is situated in front of the oesophagus in all animals that have a windpipe, and all animals have one that are furnished with lungs. The windpipe is made up of gristle, is sparingly supplied with blood, and is streaked all round with numerous minute veins; it is situated, in its upper part, near the mouth, below the aperture formed by the nostrils into the mouth – an aperture through which, when men, in drinking, inhale any of the liquid, this liquid finds its way out through the nostrils. In betwixt the two openings comes the so-

called epiglottis, an organ capable of being drawn over and covering the orifice of the windpipe communicating with the mouth; the end of the tongue is attached to the epiglottis. In the other direction the windpipe extends to the interval between the lungs, and hereupon bifurcates into each of the two divisions of the lung; for the lung in all animals possessed of the organ has a tendency to be double. In viviparous animals, however, the duplication is not so plainly discernible as in other species, and the duplication is least discernible in man. And in man the organ is not split into many parts, as is the case with some vivipara, neither is it smooth, but its surface is uneven.

In the case of the ovipara, such as birds and oviparous quadrupeds, the two parts of the organ are separated to a distance from one another, so that the creatures appear to be furnished with a pair of lungs; and from the windpipe, itself single, there branch off two separate parts extending to each of the two divisions of the lung. It is attached also to the great vein and to what is designated the 'aorta'. When the windpipe is charged with air, the air passes on to the hollow parts of the lung. These parts have divisions, composed of gristle, which meet at an acute angle; from the divisions run passages through the entire lung, giving off smaller and smaller ramifications. The heart also is attached to the windpipe, by connexions of fat, gristle, and sinew; and at the point of juncture there is a hollow. When the windpipe is charged with air, the entrance of the air into the heart, though imperceptible in some animals, is perceptible enough in the larger ones. Such are the properties of the windpipe, and it takes in and throws out air only, and takes in nothing else either dry or liquid, or else it causes you pain until you shall have coughed up whatever may have gone down.

The oesophagus communicates at the top with the mouth, close to the windpipe, and is attached to the backbone and the windpipe by membranous ligaments, and at last finds its way

through the midriff into the belly. It is composed of flesh-like substance, and is elastic both lengthways and breadthways.

The stomach of man resembles that of a dog; for it is not much bigger than the bowel, but is somewhat like a bowel of more than usual width; then comes the bowel, single, convoluted, moderately wide. The lower part of the gut is like that of a pig; for it is broad, and the part from it to the buttocks is thick and short. The caul, or great omentum, is attached to the middle of the stomach, and consists of a fatty membrane, as is the case with all other animals whose stomachs are single and which have teeth in both jaws.

The mesentery is over the bowels; this also is membranous and broad, and turns to fat. It is attached to the great vein and the aorta, and there run through it a number of veins closely packed together, extending towards the region of the bowels, beginning above and ending below.

So much for the properties of the oesophagus, the windpipe, and the stomach.

17

The heart has three cavities, and is situated above the lung at the division of the windpipe, and is provided with a fatty and thick membrane where it fastens on to the great vein and the aorta. It lies with its tapering portion upon the aorta, and this portion is similarly situated in relation to the chest in all animals that have a chest. In all animals alike, in those that have a chest and in those that have none, the apex of the heart points forwards, although this fact might possibly escape notice by a change of position under dissection. The rounded end of

the heart is at the top. The apex is to a great extent fleshy and close in texture, and in the cavities of the heart are sinews. As a rule the heart is situated in the middle of the chest in animals that have a chest, and in man it is situated a little to the left-hand side, leaning a little way from the division of the breasts towards the left breast in the upper part of the chest.

The heart is not large, and in its general shape it is not elongated; in fact, it is somewhat round in form: only, be it remembered, it is sharp-pointed at the bottom. It has three cavities, as has been said: the right-hand one the largest of the three, the left-hand one the least, and the middle one intermediate in size. All these cavities, even the two small ones, are connected by passages with the lung, and this fact is rendered quite plain in one of the cavities. And below, at the point of attachment, in the largest cavity there is a connexion with the great vein (near which the mesentery lies); and in the middle one there is a connexion with the aorta.

Canals lead from the heart into the lung, and branch off just as the windpipe does, running all over the lung parallel with the passages from the windpipe. The canals from the heart are uppermost; and there is no common passage, but the passages through their having a common wall receive the breath and pass it on to the heart; and one of the passages conveys it to the right cavity, and the other to the left.

With regard to the great vein and the aorta we shall, by and by, treat of them together in a discussion devoted to them and to them alone. In all animals that are furnished with a lung, and that are both internally and externally viviparous, the lung is of all organs the most richly supplied with blood; for the lung is throughout spongy in texture, and along by every single pore in it go branches from the great vein. Those who imagine it to be empty are altogether mistaken; and they are led into their error

by their observation of lungs removed from animals under dissection, out of which organs the blood had all escaped immediately after death.

Of the other internal organs the heart alone contains blood. And the lung has blood not in itself but in its veins, but the heart has blood in itself; for in each of its three cavities it has blood, but the thinnest blood is what it has in its central cavity.

Under the lung comes the thoracic diaphragm or midriff, attached to the ribs, the hypochondria and the backbone, with a thin membrane in the middle of it. It has veins running through it; and the diaphragm in the case of man is thicker in proportion to the size of his frame than in other animals.

Under the diaphragm on the right-hand side lies the 'liver', and on the left-hand side the 'spleen', alike in all animals that are provided with these organs in an ordinary and not preternatural way; for, be it observed, in some quadrupeds these organs have been found in a transposed position. These organs are connected with the stomach by the caul.

To outward view the spleen of man is narrow and long, resembling the self-same organ in the pig. The liver in the great majority of animals is not provided with a 'gall-bladder'; but the latter is present in some. The liver of a man is round-shaped, and resembles the same organ in the ox. And, by the way, the absence above referred to of a gall-bladder is at times met with in the practice of augury. For instance, in a certain district of the Chalcidic settlement in Euboea the sheep are devoid of gall-bladders; and in Naxos nearly all the quadrupeds have one so large that foreigners when they offer sacrifice with such victims are bewildered with fright, under the impression that the phenomenon is not due to natural causes, but bodes some mischief to the individual offerers of the sacrifice.

Again, the liver is attached to the great vein, but it has no communication with the aorta; for the vein that goes off from the great vein goes right through the liver, at a point where are the so-called 'portals' of the liver. The spleen also is connected only with the great vein, for a vein extends to the spleen off from it.

After these organs come the 'kidneys', and these are placed close to the backbone, and resemble in character the same organ in kine. In all animals that are provided with this organ, the right kidney is situated higher up than the other. It has also less fatty substance than the left-hand one and is less moist. And this phenomenon also is observable in all the other animals alike.

Furthermore, passages or ducts lead into the kidneys both from the great vein and from the aorta, only not into the cavity. For, by the way, there is a cavity in the middle of the kidney, bigger in some creatures and less in others; but there is none in the case of the seal. This latter animal has kidneys resembling in shape the identical organ in kine, but in its case the organs are more solid than in any other known creature. The ducts that lead into the kidneys lose themselves in the substance of the kidneys themselves; and the proof that they extend no farther rests on the fact that they contain no blood, nor is any clot found therein. The kidneys, however, have, as has been said, a small cavity. From this cavity in the kidney there lead two considerable ducts or ureters into the bladder; and others spring from the aorta, strong and continuous. And to the middle of each of the two kidneys is attached a hollow sinewy vein, stretching right along the spine through the narrows; by and by these veins are lost in either loin, and again become visible extending to the flank. And these off-branchings of the veins terminate in the bladder. For the bladder lies at the extremity, and is held in position by the ducts stretching from the kidneys,

along the stalk that extends to the urethra; and pretty well all round it is fastened by fine sinewy membranes, that resemble to some extent the thoracic diaphragm. The bladder in man is, proportionately to his size, tolerably large.

To the stalk of the bladder the private part is attached, the external orifices coalescing; but a little lower down, one of the openings communicates with the testicles and the other with the bladder. The penis is gristly and sinewy in its texture. With it are connected the testicles in male animals, and the properties of these organs we shall discuss in our general account of the said organ.

All these organs are similar in the female; for there is no difference in regard to the internal organs, except in respect to the womb, and with reference to the appearance of this organ I must refer the reader to diagrams in my 'Anatomy'. The womb, however, is situated over the bowel, and the bladder lies over the womb. But we must treat by and by in our pages of the womb of all female animals viewed generally. For the wombs of all female animals are not identical, neither do their local dispositions coincide.

These are the organs, internal and external, of man, and such is their nature and such their local disposition.

Book II

1

With regard to animals in general, some parts or organs are common to all, as has been said, and some are common only to particular genera; the parts, moreover, are identical with or different from one another on the lines already repeatedly laid down. For as a general rule all animals that are generically distinct have the majority of their parts or organs different in form or species; and some of them they have only analogically similar and diverse in kind or genus, while they have others that are alike in kind but specifically diverse; and many parts or organs exist in some animals, but not in others.

For instance, viviparous quadrupeds have all a head and a neck, and all the parts or organs of the head, but they differ each from other in the shapes of the parts. The lion has its neck composed of one single bone instead of vertebrae; but, when dissected, the animal is found in all internal characters to resemble the dog.

The quadrupedal vivipara instead of arms have forelegs. This is true of all quadrupeds, but such of them as have toes have, practically speaking, organs analogous to hands; at all events, they use these fore-limbs for many purposes as hands. And they have the limbs on the left-hand side less distinct from those on the right than man.

The fore-limbs then serve more or less the purpose of hands in quadrupeds, with the exception of the elephant. This latter animal has its toes somewhat indistinctly defined, and its front legs are much bigger than its hinder ones; it is five-toed, and has short ankles to its hind feet. But it has a nose such in

properties and such in size as to allow of its using the same for a hand. For it eats and drinks by lifting up its food with the aid of this organ into its mouth, and with the same organ it lifts up articles to the driver on its back; with this organ it can pluck up trees by the roots, and when walking through water it spouts the water up by means of it; and this organ is capable of being crooked or coiled at the tip, but not of flexing like a joint, for it is composed of gristle.

Of all animals man alone can learn to make equal use of both hands.

All animals have a part analogous to the chest in man, but not similar to his; for the chest in man is broad, but that of all other animals is narrow. Moreover, no other animal but man has breasts in front; the elephant, certainly, has two breasts, not however in the chest, but near it.

Moreover, also, animals have the flexions of their fore and hind limbs in directions opposite to one another, and in directions the reverse of those observed in the arms and legs of man; with the exception of the elephant. In other words, with the viviparous quadrupeds the front legs bend forwards and the hind ones backwards, and the concavities of the two pairs of limbs thus face one another.

The elephant does not sleep standing, as some were wont to assert, but it bends its legs and settles down; only that in consequence of its weight it cannot bend its leg on both sides simultaneously, but falls into a recumbent position on one side or the other, and in this position it goes to sleep. And it bends its hind legs just as a man bends his legs.

In the case of the ovipara, as the crocodile and the lizard and the like, both pairs of legs, fore and hind, bend forwards, with a slight swerve on one side. The flexion is similar in the case of

the multipeds; only that the legs in between the extreme ends always move in a manner intermediate between that of those in front and those behind, and accordingly bend sideways rather than backwards or forwards. But man bends his arms and his legs towards the same point, and therefore in opposite ways: that is to say, he bends his arms backwards, with just a slight inclination inwards, and his legs frontwards. No animal bends both its fore-limbs and hind-limbs backwards; but in the case of all animals the flexion of the shoulders is in the opposite direction to that of the elbows or the joints of the forelegs, and the flexure in the hips to that of the knees of the hind-legs: so that since man differs from other animals in flexion, those animals that possess such parts as these move them contrariwise to man.

Birds have the flexions of their limbs like those of the quadrupeds; for, although bipeds, they bend their legs backwards, and instead of arms or front legs have wings which bend frontwards.

The seal is a kind of imperfect or crippled quadruped; for just behind the shoulder-blade its front feet are placed, resembling hands, like the front paws of the bear; for they are furnished with five toes, and each of the toes has three flexions and a nail of inconsiderable size. The hind feet are also furnished with five toes; in their flexions and nails they resemble the front feet, and in shape they resemble a fish's tail.

The movements of animals, quadruped and multiped, are crosswise, or in diagonals, and their equilibrium in standing posture is maintained crosswise; and it is always the limb on the right-hand side that is the first to move. The lion, however, and the two species of camels, both the Bactrian and the Arabian, progress by an amble; and the action so called is when

the animal never overpasses the right with the left, but always follows close upon it.

Whatever parts men have in front, these parts quadrupeds have below, in or on the belly; and whatever parts men have behind, these parts quadrupeds have above on their backs. Most quadrupeds have a tail; for even the seal has a tiny one resembling that of the stag. Regarding the tails of the pithecoids we must give their distinctive properties by and by animal

All viviparous quadrupeds are hair-coated, whereas man has only a few short hairs excepting on the head, but, so far as the head is concerned, he is hairier than any other animal. Further, of hair-coated animals, the back is hairier than the belly, which latter is either comparatively void of hair or smooth and void of hair altogether. With man the reverse is the case.

Man also has upper and lower eyelashes, and hair under the armpits and on the pubes. No other animal has hair in either of these localities, or has an under eyelash; though in the case of some animals a few straggling hairs grow under the eyelid.

Of hair-coated quadrupeds some are hairy all over the body, as the pig, the bear, and the dog; others are especially hairy on the neck and all round about it, as is the case with animals that have a shaggy mane, such as the lion; others again are especially hairy on the upper surface of the neck from the head as far as the withers, namely, such as have a crested mane, as in the case with the horse, the mule, and, among the undomesticated horned animals, the bison.

The so-called hippelaphus also has a mane on its withers, and the animal called pardion, in either case a thin mane extending from the head to the withers; the hippelaphus has, exceptionally, a beard by the larynx. Both these animals have horns and are cloven-footed; the female, however, of the

hippelaphus has no horns. This latter animal resembles the stag in size; it is found in the territory of the Arachotae, where the wild cattle also are found. Wild cattle differ from their domesticated congeners just as the wild boar differs from the domesticated one. That is to say they are black, strong looking, with a hook-nosed muzzle, and with horns lying more over the back. The horns of the hippelaphus resemble those of the gazelle.

The elephant, by the way, is the least hairy of all quadrupeds. With animals, as a general rule, the tail corresponds with the body as regards thickness or thinness of hair-coating; that is, with animals that have long tails, for some creatures have tails of altogether insignificant size.

Camels have an exceptional organ wherein they differ from all other animals, and that is the so-called ‘hump’ on their back. The Bactrian camel differs from the Arabian; for the former has two humps and the latter only one, though it has, by the way, a kind of a hump below like the one above, on which, when it kneels, the weight of the whole body rests. The camel has four teats like the cow, a tail like that of an ass, and the privy parts of the male are directed backwards. It has one knee in each leg, and the flexures of the limb are not manifold, as some say, although they appear to be so from the constricted shape of the region of the belly. It has a huckle-bone like that of kine, but meagre and small in proportion to its bulk. It is cloven-footed, and has not got teeth in both jaws; and it is cloven footed in the following way: at the back there is a slight cleft extending as far up as the second joint of the toes; and in front there are small hooves on the tip of the first joint of the toes; and a sort of web passes across the cleft, as in geese. The foot is fleshy underneath, like that of the bear; so that, when the animal goes to war, they protect its feet, when they get sore, with sandals.

The legs of all quadrupeds are bony, sinewy, and fleshless; and in point of fact such is the case with all animals that are furnished with feet, with the exception of man. They are also unfurnished with buttocks; and this last point is plain in an especial degree in birds. It is the reverse with man; for there is scarcely any part of the body in which man is so fleshy as in the buttock, the thigh, and the calf; for the part of the leg called gastroenemia or is fleshy.

Of blooded and viviparous quadrupeds some have the foot cloven into many parts, as is the case with the hands and feet of man (for some animals, by the way, are many-toed, as the lion, the dog, and the pard); others have feet cloven in twain, and instead of nails have hooves, as the sheep, the goat, the deer, and the hippopotamus; others are uncloven of foot, such for instance as the solid-hooved animals, the horse and the mule. Swine are either cloven-footed or uncloven-footed; for there are in Illyria and in Paeonia and elsewhere solid-hooved swine. The cloven-footed animals have two clefts behind; in the solid-hooved this part is continuous and undivided.

Furthermore, of animals some are horned, and some are not so. The great majority of the horned animals are cloven-footed, as the ox, the stag, the goat; and a solid-hooved animal with a pair of horns has never yet been met with. But a few animals are known to be singled-horned and single-hooved, as the Indian ass; and one, to wit the oryx, is single horned and cloven-hooved.

Of all solid-hooved animals the Indian ass alone has an astragalus or huckle-bone; for the pig, as was said above, is either solid-hooved or cloven-footed, and consequently has no well-formed huckle-bone. Of the cloven footed many are provided with a huckle-bone. Of the many-fingered or many-toed, no single one has been observed to have a huckle-bone,

none of the others any more than man. The lynx, however, has something like a hemiastragal, and the lion something resembling the sculptor's 'labyrinth'. All the animals that have a huckle-bone have it in the hinder legs. They have also the bone placed straight up in the joint; the upper part, outside; the lower part, inside; the sides called Coa turned towards one another, the sides called Chia outside, and the keraiae or 'horns' on the top. This, then, is the position of the hucklebone in the case of all animals provided with the part.

Some animals are, at one and the same time, furnished with a mane and furnished also with a pair of horns bent in towards one another, as is the bison (or aurochs), which is found in Paeonia and Maedica. But all animals that are horned are quadrupedal, except in cases where a creature is said metaphorically, or by a figure of speech, to have horns; just as the Egyptians describe the serpents found in the neighbourhood of Thebes, while in point of fact the creatures have merely protuberances on the head sufficiently large to suggest such an epithet.

Of horned animals the deer alone has a horn, or antler, hard and solid throughout. The horns of other animals are hollow for a certain distance, and solid towards the extremity. The hollow part is derived from the skin, but the core round which this is wrapped – the hard part – is derived from the bones; as is the case with the horns of oxen. The deer is the only animal that sheds its horns, and it does so annually, after reaching the age of two years, and again renews them. All other animals retain their horns permanently, unless the horns be damaged by accident.

Again, with regard to the breasts and the generative organs, animals differ widely from one another and from man. For instance, the breasts of some animals are situated in front,

either in the chest or near to it, and there are in such cases two breasts and two teats, as is the case with man and the elephant, as previously stated. For the elephant has two breasts in the region of the axillae; and the female elephant has two breasts insignificant in size and in no way proportionate to the bulk of the entire frame, in fact, so insignificant as to be invisible in a sideways view; the males also have breasts, like the females, exceedingly small. The she-bear has four breasts. Some animals have two breasts, but situated near the thighs, and teats, likewise two in number, as the sheep; others have four teats, as the cow. Some have breasts neither in the chest nor at the thighs, but in the belly, as the dog and pig; and they have a considerable number of breasts or dugs, but not all of equal size. Thus the shepard has four dugs in the belly, the lioness two, and others more. The she-camel, also, has two dugs and four teats, like the cow. Of solid-hooved animals the males have no dugs, excepting in the case of males that take after the mother, which phenomenon is observable in horses.

Of male animals the genitals of some are external, as is the case with man, the horse, and most other creatures; some are internal, as with the dolphin. With those that have the organ externally placed, the organ in some cases is situated in front, as in the cases already mentioned, and of these some have the organ detached, both penis and testicles, as man; others have penis and testicles closely attached to the belly, some more closely, some less; for this organ is not detached in the wild boar nor in the horse.

The penis of the elephant resembles that of the horse; compared with the size of the animal it is disproportionately small; the testicles are not visible, but are concealed inside in the vicinity of the kidneys; and for this reason the male speedily gives over in the act of intercourse. The genitals of the female are situated where the udder is in sheep; when she is in heat,

she draws the organ back and exposes it externally, to facilitate the act of intercourse for the male; and the organ opens out to a considerable extent.

With most animals the genitals have the position above assigned; but some animals discharge their urine backwards, as the lynx, the lion, the camel, and the hare. Male animals differ from one another, as has been said, in this particular, but all female animals are retromingent: even the female elephant like other animals, though she has the privy part below the thighs.

In the male organ itself there is a great diversity. For in some cases the organ is composed of flesh and gristle, as in man; in such cases, the fleshy part does not become inflated, but the gristly part is subject to enlargement. In other cases, the organ is composed of fibrous tissue, as with the camel and the deer; in other cases it is bony, as with the fox, the wolf, the marten, and the weasel; for this organ in the weasel has a bone.

When man has arrived at maturity, his upper part is smaller than the lower one, but with all other blooded animals the reverse holds good. By the 'upper' part we mean all extending from the head down to the parts used for excretion of residuum, and by the 'lower' part else. With animals that have feet the hind legs are to be rated as the lower part in our comparison of magnitudes, and with animals devoid of feet, the tail, and the like.

When animals arrive at maturity, their properties are as above stated; but they differ greatly from one another in their growth towards maturity. For instance, man, when young, has his upper part larger than the lower, but in course of growth he comes to reverse this condition; and it is owing to this circumstance that – an exceptional instance, by the way – he does not progress in early life as he does at maturity, but in infancy creeps on all fours; but some animals, in growth, retain the relative

proportion of the parts, as the dog. Some animals at first have the upper part smaller and the lower part larger, and in course of growth the upper part gets to be the larger, as is the case with the bushy-tailed animals such as the horse; for in their case there is never, subsequently to birth, any increase in the part extending from the hoof to the haunch.

Again, in respect to the teeth, animals differ greatly both from one another and from man. All animals that are quadrupedal, blooded and viviparous, are furnished with teeth; but, to begin with, some are double-toothed (or fully furnished with teeth in both jaws), and some are not. For instance, horned quadrupeds are not double-toothed; for they have not got the front teeth in the upper jaw; and some hornless animals, also, are not double toothed, as the camel. Some animals have tusks, like the boar, and some have not. Further, some animals are saw-toothed, such as the lion, the pard, and the dog; and some have teeth that do not interlock but have flat opposing crowns, as the horse and the ox; and by 'saw-toothed' we mean such animals as interlock the sharp-pointed teeth in one jaw between the sharp-pointed ones in the other. No animal is there that possesses both tusks and horns, nor yet do either of these structures exist in any animal possessed of 'saw-teeth'. The front teeth are usually sharp, and the back ones blunt. The seal is saw-toothed throughout, inasmuch as he is a sort of link with the class of fishes; for fishes are almost all saw-toothed.

No animal of these genera is provided with double rows of teeth. There is, however, an animal of the sort, if we are to believe Ctesias. He assures us that the Indian wild beast called the 'martichoras' has a triple row of teeth in both upper and lower jaw; that it is as big as a lion and equally hairy, and that its feet resemble those of the lion; that it resembles man in its face and ears; that its eyes are blue, and its colour vermilion; that its tail is like that of the land-scorpion; that it has a sting in

the tail, and has the faculty of shooting off arrow-wise the spines that are attached to the tail; that the sound of its voice is a something between the sound of a pan-pipe and that of a trumpet; that it can run as swiftly as deer, and that it is savage and a man-eater.

Man sheds his teeth, and so do other animals, as the horse, the mule, and the ass. And man sheds his front teeth; but there is no instance of an animal that sheds its molars. The pig sheds none of its teeth at all.

2

With regard to dogs some doubts are entertained, as some contend that they shed no teeth whatever, and others that they shed the canines, but those alone; the fact being, that they do shed their teeth like man, but that the circumstance escapes observation, owing to the fact that they never shed them until equivalent teeth have grown within the gums to take the place of the shed ones. We shall be justified in supposing that the case is similar with wild beasts in general; for they are said to shed their canines only. Dogs can be distinguished from one another, the young from the old, by their teeth; for the teeth in young dogs are white and sharp-pointed; in old dogs, black and blunt.

3

In this particular, the horse differs entirely from animals in general: for, generally speaking, as animals grow older their teeth get blacker, but the horse's teeth grow whiter with age.

The so-called 'canines' come in between the sharp teeth and the broad or blunt ones, partaking of the form of both kinds; for they are broad at the base and sharp at the tip.

Males have more teeth than females in the case of men, sheep, goats, and swine; in the case of other animals observations have not yet been made: but the more teeth they have the more long-lived are they, as a rule, while those are short-lived in proportion that have teeth fewer in number and thinly set.

4

The last teeth to come in man are molars called 'wisdom-teeth', which come at the age of twenty years, in the case of both sexes. Cases have been known in women upwards. of eighty years old where at the very close of life the wisdom-teeth have come up, causing great pain in their coming; and cases have been known of the like phenomenon in men too. This happens, when it does happen, in the case of people where the wisdom-teeth have not come up in early years.

5

The elephant has four teeth on either side, by which it munches its food, grinding it like so much barley-meal, and, quite apart from these, it has its great teeth, or tusks, two in number. In the male these tusks are comparatively large and curved upwards; in the female, they are comparatively small and point in the opposite direction; that is, they look downwards towards the ground. The elephant is furnished with teeth at birth, but the tusks are not then visible.

6

The tongue of the elephant is exceedingly small, and situated far back in the mouth, so that it is difficult to get a sight of it.

7

Furthermore, animals differ from one another in the relative size of their mouths. In some animals the mouth opens wide, as is the case with the dog, the lion, and with all the saw-toothed animals; other animals have small mouths, as man; and others have mouths of medium capacity, as the pig and his congeners.

(The Egyptian hippopotamus has a mane like a horse, is cloven-footed like an ox, and is snub-nosed. It has a huckle-bone like cloven-footed animals, and tusks just visible; it has the tail of a pig, the neigh of a horse, and the dimensions of an ass. The hide is so thick that spears are made out of it. In its internal organs it resembles the horse and the ass.)

8

Some animals share the properties of man and the quadrupeds, as the ape, the monkey, and the baboon. The monkey is a tailed ape. The baboon resembles the ape in form, only that it is bigger and stronger, more like a dog in face, and is more savage in its habits, and its teeth are more dog-like and more powerful.

Apes are hairy on the back in keeping with their quadrupedal nature, and hairy on the belly in keeping with their human form – for, as was said above, this characteristic is reversed in man and the quadruped – only that the hair is coarse, so that the ape is thickly coated both on the belly and on the back. Its face resembles that of man in many respects; in other words, it has similar nostrils and ears, and teeth like those of man, both front teeth and molars. Further, whereas quadrupeds in general are not furnished with lashes on one of the two eyelids, this creature has them on both, only very thinly set, especially the under ones; in fact they are very insignificant indeed. And we must bear in mind that all other quadrupeds have no under eyelash at all.

The ape has also in its chest two teats upon poorly developed breasts. It has also arms like man, only covered with hair, and it bends these legs like man, with the convexities of both limbs facing one another. In addition, it has hands and fingers and nails like man, only that all these parts are somewhat more beast-like in appearance. Its feet are exceptional in kind. That is, they are like large hands, and the toes are like fingers, with the middle one the longest of all, and the under part of the foot is like a hand except for its length, and stretches out towards the extremities like the palm of the hand; and this palm at the after

end is unusually hard, and in a clumsy obscure kind of way resembles a heel. The creature uses its feet either as hands or feet, and doubles them up as one doubles a fist. Its upper-arm and thigh are short in proportion to the forearm and the shin. It has no projecting navel, but only a hardness in the ordinary locality of the navel. Its upper part is much larger than its lower part, as is the case with quadrupeds; in fact, the proportion of the former to the latter is about as five to three. Owing to this circumstance and to the fact that its feet resemble hands and are composed in a manner of hand and of foot: of foot in the heel extremity, of the hand in all else – for even the toes have what is called a 'palm': – for these reasons the animal is oftener to be found on all fours than upright. It has neither hips, inasmuch as it is a quadruped, nor yet a tail, inasmuch as it is a biped, except nor yet a tal by the way that it has a tail as small as small can be, just a sort of indication of a tail. The genitals of the female resemble those of the female in the human species; those of the male are more like those of a dog than are those of a man.

9

The monkey, as has been observed, is furnished with a tail. In all such creatures the internal organs are found under dissection to correspond to those of man.

So much then for the properties of the organs of such animals as bring forth their young into the world alive.

10

Oviparous and blooded quadrupeds – and, by the way, no terrestrial blooded animal is oviparous unless it is quadrupedal or is devoid of feet altogether – are furnished with a head, a neck, a back, upper and under parts, the front legs and hind legs, and the part analogous to the chest, all as in the case of viviparous quadrupeds, and with a tail, usually large, in exceptional cases small. And all these creatures are many-toed, and the several toes are cloven apart. Furthermore, they all have the ordinary organs of sensation, including a tongue, with the exception of the Egyptian crocodile.

This latter animal, by the way, resembles certain fishes. For, as a general rule, fishes have a prickly tongue, not free in its movements; though there are some fishes that present a smooth undifferentiated surface where the tongue should be, until you open their mouths wide and make a close inspection.

Again, oviparous blooded quadrupeds are unprovided with ears, but possess only the passage for hearing; neither have they breasts, nor a copulatory organ, nor external testicles, but internal ones only; neither are they hair coated, but are in all cases covered with scaly plates. Moreover, they are without exception saw-toothed.

River crocodiles have pigs' eyes, large teeth and tusks, and strong nails, and an impenetrable skin composed of scaly plates. They see but poorly under water, but above the surface of it with remarkable acuteness. As a rule, they pass the day-time on land and the nighttime in the water; for the temperature of the water is at night-time more genial than that of the open air.

11

The chameleon resembles the lizard in the general configuration of its body, but the ribs stretch downwards and meet together under the belly as is the case with fishes, and the spine sticks up as with the fish. Its face resembles that of the baboon. Its tail is exceedingly long, terminates in a sharp point, and is for the most part coiled up, like a strap of leather. It stands higher off the ground than the lizard, but the flexure of the legs is the same in both creatures. Each of its feet is divided into two parts, which bear the same relation to one another that the thumb and the rest of the hand bear to one another in man. Each of these parts is for a short distance divided after a fashion into toes; on the front feet the inside part is divided into three and the outside into two, on the hind feet the inside part into two and the outside into three; it has claws also on these parts resembling those of birds of prey. Its body is rough all over, like that of the crocodile. Its eyes are situated in a hollow recess, and are very large and round, and are enveloped in a skin resembling that which covers the entire body; and in the middle a slight aperture is left for vision, through which the animal sees, for it never covers up this aperture with the cutaneous envelope. It keeps twisting its eyes round and shifting its line of vision in every direction, and thus contrives to get a sight of any object that it wants to see. The change in its colour takes place when it is inflated with air; it is then black, not unlike the crocodile, or green like the lizard but black-spotted like the pard. This change of colour takes place over the whole body alike, for the eyes and the tail come alike under its influence. In its movements it is very sluggish, like the tortoise. It assumes a greenish hue in dying, and retains this hue after death. It resembles the lizard in the position of the oesophagus and the windpipe. It has no flesh anywhere except a few scraps of flesh on the head and on the jaws and near to the root of the tail. It has blood only round about the heart, the eyes, the region above

the heart, and in all the veins extending from these parts; and in all these there is but little blood after all. The brain is situated a little above the eyes, but connected with them. When the outer skin is drawn aside from off the eye, a something is found surrounding the eye, that gleams through like a thin ring of copper. Membranes extend well nigh over its entire frame, numerous and strong, and surpassing in respect of number and relative strength those found in any other animal. After being cut open along its entire length it continues to breathe for a considerable time; a very slight motion goes on in the region of the heart, and, while contraction is especially manifested in the neighbourhood of the ribs, a similar motion is more or less discernible over the whole body. It has no spleen visible. It hibernates, like the lizard.

12

Birds also in some parts resemble the above mentioned animals; that is to say, they have in all cases a head, a neck, a back, a belly, and what is analogous to the chest. The bird is remarkable among animals as having two feet, like man; only, by the way, it bends them backwards as quadrupeds bend their hind legs, as was noticed previously. It has neither hands nor front feet, but wings – an exceptional structure as compared with other animals. Its haunch-bone is long, like a thigh, and is attached to the body as far as the middle of the belly; so like to a thigh is it that when viewed separately it looks like a real one, while the real thigh is a separate structure betwixt it and the shin. Of all birds those that have crooked talons have the biggest thighs and the strongest breasts. All birds are furnished with many claws, and all have the toes separated more or less asunder; that is to say, in the greater part the toes are clearly

distinct from one another, for even the swimming birds, although they are web-footed, have still their claws fully articulated and distinctly differentiated from one another. Birds that fly high in air are in all cases four-toed: that is, the greater part have three toes in front and one behind in place of a heel; some few have two in front and two behind, as the wryneck.

This latter bird is somewhat bigger than the chaffinch, and is mottled in appearance. It is peculiar in the arrangement of its toes, and resembles the snake in the structure of its tongue; for the creature can protrude its tongue to the extent of four finger-breadths, and then draw it back again. Moreover, it can twist its head backwards while keeping all the rest of its body still, like the serpent. It has big claws, somewhat resembling those of the woodpecker. Its note is a shrill chirp.

Birds are furnished with a mouth, but with an exceptional one, for they have neither lips nor teeth, but a beak. Neither have they ears nor a nose, but only passages for the sensations connected with these organs: that for the nostrils in the beak, and that for hearing in the head. Like all other animals they all have two eyes, and these are devoid of lashes. The heavy-bodied (or gallinaceous) birds close the eye by means of the lower lid, and all birds blink by means of a skin extending over the eye from the inner corner; the owl and its congeners also close the eye by means of the upper lid. The same phenomenon is observable in the animals that are protected by horny scutes, as in the lizard and its congeners; for they all without exception close the eye with the lower lid, but they do not blink like birds. Further, birds have neither scutes nor hair, but feathers; and the feathers are invariably furnished with quills. They have no tail, but a rump with tail-feathers, short in such as are long-legged and web-footed, large in others. These latter kinds of birds fly with their feet tucked up close to the belly; but the small rumped or short-tailed birds fly with their legs stretched out at

full length. All are furnished with a tongue, but the organ is variable, being long in some birds and broad in others. Certain species of birds above all other animals, and next after man, possess the faculty of uttering articulate sounds; and this faculty is chiefly developed in broad-tongued birds. No oviparous creature has an epiglottis over the windpipe, but these animals so manage the opening and shutting of the windpipe as not to allow any solid substance to get down into the lung.

Some species of birds are furnished additionally with spurs, but no bird with crooked talons is found so provided. The birds with talons are among those that fly well, but those that have spurs are among the heavy-bodied.

Again, some birds have a crest. As a general rule the crest sticks up, and is composed of feathers only; but the crest of the barn-door cock is exceptional in kind, for, whereas it is not just exactly flesh, at the same time it is not easy to say what else it is.

13

Of water animals the genus of fishes constitutes a single group apart from the rest, and including many diverse forms.

In the first place, the fish has a head, a back, a belly, in the neighbourhood of which last are placed the stomach and viscera; and behind it has a tail of continuous, undivided shape, but not, by the way, in all cases alike. No fish has a neck, or any limb, or testicles at all, within or without, or breasts. But, by the way this absence of breasts may predicated of all non-viviparous animals; and in point of fact viviparous animals are

not in all cases provided with the organ, excepting such as are directly viviparous without being first oviparous. Thus the dolphin is directly viviparous, and accordingly we find it furnished with two breasts, not situated high up, but in the neighbourhood of the genitals. And this creature is not provided, like quadrupeds, with visible teats, but has two vents, one on each flank, from which the milk flows; and its young have to follow after it to get suckled, and this phenomenon has been actually witnessed.

Fishes, then, as has been observed, have no breasts and no passage for the genitals visible externally. But they have an exceptional organ in the gills, whereby, after taking the water in the mouth, they discharge it again; and in the fins, of which the greater part have four, and the lanky ones two, as, for instance, the eel, and these two situated near to the gills. In like manner the grey mullet – as, for instance, the mullet found in the lake at Siphae – have only two fins; and the same is the case with the fish called Ribbon-fish. Some of the lanky fishes have no fins at all, such as the muraena, nor gills articulated like those of other fish.

And of those fish that are provided with gills, some have coverings for this organ, whereas all the selachians have the organ unprotected by a cover. And those fishes that have coverings or opercula for the gills have in all cases their gills placed sideways; whereas, among selachians, the broad ones have the gills down below on the belly, as the torpedo and the ray, while the lanky ones have the organ placed sideways, as is the case in all the dog-fish.

The fishing-frog has gills placed sideways, and covered not with a spiny operculum, as in all but the selachian fishes, but with one of skin.

Morever, with fishes furnished with gills, the gills in some cases are simple in others duplicate; and the last gill in the direction of the body is always simple. And, again, some fishes have few gills, and others have a great number; but all alike have the same number on both sides. Those that have the least number have one gill on either side, and this one duplicate, like the boar-fish; others have two on either side, one simple and the other duplicate, like the conger and the scarus; others have four on either side, simple, as the elops, the synagris, the muraena, and the eel; others have four, all, with the exception of the hindmost one, in double rows, as the wrasse, the perch, the sheat-fish, and the carp. The dog-fish have all their gills double, five on a side; and the sword-fish has eight double gills. So much for the number of gills as found in fishes.

Again, fishes differ from other animals in more ways than as regards the gills. For they are not covered with hairs as are viviparous land animals, nor, as is the case with certain oviparous quadrupeds, with tessellated scutes, nor, like birds, with feathers; but for the most part they are covered with scales. Some few are rough-skinned, while the smooth-skinned are very few indeed. Of the Selachia some are rough-skinned and some smooth-skinned; and among the smooth-skinned fishes are included the conger, the eel, and the tunny.

All fishes are saw-toothed excepting the scarus; and the teeth in all cases are sharp and set in many rows, and in some cases are placed on the tongue. The tongue is hard and spiny, and so firmly attached that fishes in many instances seem to be devoid of the organ altogether. The mouth in some cases is wide-stretched, as it is with some viviparous quadrupeds....

With regard to organs of sense, all save eyes, fishes possess none of them, neither the organs nor their passages, neither ears nor nostrils; but all fishes are furnished with eyes, and the

eyes devoid of lids, though the eyes are not hard; with regard to the organs connected with the other senses, hearing and smell, they are devoid alike of the organs themselves and of passages indicative of them.

Fishes without exception are supplied with blood. Some of them are oviparous, and some viviparous; scaly fish are invariably oviparous, but cartilaginous fishes are all viviparous, with the single exception of the fishing-frog.

14

Of blooded animals there now remains the serpent genus. This genus is common to both elements, for, while most species comprehended therein are land animals, a small minority, to wit the aquatic species, pass their lives in fresh water. There are also sea-serpents, in shape to a great extent resembling their congeners of the land, with this exception that the head in their case is somewhat like the head of the conger; and there are several kinds of sea-serpent, and the different kinds differ in colour; these animals are not found in very deep water. Serpents, like fish, are devoid of feet.

There are also sea-scolopendras, resembling in shape their land congeners, but somewhat less in regard to magnitude. These creatures are found in the neighbourhood of rocks; as compared with their land congeners they are redder in colour, are furnished with feet in greater numbers and with legs of more delicate structure. And the same remark applies to them as to the sea-serpents, that they are not found in very deep water.

Of fishes whose habitat is in the vicinity of rocks there is a tiny one, which some call the Echeneis, or ‘ship-holder’, and which

is by some people used as a charm to bring luck in affairs of law and love. The creature is unfit for eating. Some people assert that it has feet, but this is not the case: it appears, however, to be furnished with feet from the fact that its fins resemble those organs.

So much, then, for the external parts of blooded animals, as regards their numbers, their properties, and their relative diversities.

15

As for the properties of the internal organs, these we must first discuss in the case of the animals that are supplied with blood. For the principal genera differ from the rest of animals, in that the former are supplied with blood and the latter are not; and the former include man, viviparous and oviparous quadrupeds, birds, fishes, cetaceans, and all the others that come under no general designation by reason of their not forming genera, but groups of which simply the specific name is predicable, as when we say 'the serpent,' the 'crocodile'.

All viviparous quadrupeds, then, are furnished with an oesophagus and a windpipe, situated as in man; the same statement is applicable to oviparous quadrupeds and to birds, only that the latter present diversities in the shapes of these organs. As a general rule, all animals that take up air and breathe it in and out are furnished with a lung, a windpipe, and an oesophagus, with the windpipe and oesophagus not admitting of diversity in situation but admitting of diversity in properties, and with the lung admitting of diversity in both these respects. Further, all blooded animals have a heart and a diaphragm or midriff; but in small animals the existence of the

latter organ is not so obvious owing to its delicacy and minute size.

In regard to the heart there is an exceptional phenomenon observable in oxen. In other words, there is one species of ox where, though not in all cases, a bone is found inside the heart. And, by the way, the horse's heart also has a bone inside it.

The genera referred to above are not in all cases furnished with a lung: for instance, the fish is devoid of the organ, as is also every animal furnished with gills. All blooded animals are furnished with a liver. As a general rule blooded animals are furnished with a spleen; but with the great majority of non-viviparous but oviparous animals the spleen is so small as all but to escape observation; and this is the case with almost all birds, as with the pigeon, the kite, the falcon, the owl: in point of fact, the aegocephalus is devoid of the organ altogether. With oviparous quadrupeds the case is much the same as with the viviparous; that is to say, they also have the spleen exceedingly minute, as the tortoise, the freshwater tortoise, the toad, the lizard, the crocodile, and the frog.

Some animals have a gall-bladder close to the liver, and others have not. Of viviparous quadrupeds the deer is without the organ, as also the roe, the horse, the mule, the ass, the seal, and some kinds of pigs. Of deer those that are called Achainae appear to have gall in their tail, but what is so called does resemble gall in colour, though it is not so completely fluid, and the organ internally resembles a spleen.

However, without any exception, stags are found to have maggots living inside the head, and the habitat of these creatures is in the hollow underneath the root of the tongue and in the neighbourhood of the vertebra to which the head is attached. These creatures are as large as the largest grubs; they

grow all together in a cluster, and they are usually about twenty in number.

Deer then, as has been observed, are without a gall-bladder; their gut, however, is so bitter that even hounds refuse to eat it unless the animal is exceptionally fat. With the elephant also the liver is unfurnished with a gall-bladder, but when the animal is cut in the region where the organ is found in animals furnished with it, there oozes out a fluid resembling gall, in greater or less quantities. Of animals that take in sea-water and are furnished with a lung, the dolphin is unprovided with a gall-bladder. Birds and fishes all have the organ, as also oviparous quadrupeds, all to a greater or a lesser extent. But of fishes some have the organ close to the liver, as the dogfishes, the sheat-fish, the rhine or angel-fish, the smooth skate, the torpedo, and, of the lanky fishes, the eel, the pipe-fish, and the hammer-headed shark. The callionymus, also, has the gall-bladder close to the liver, and in no other fish does the organ attain so great a relative size. Other fishes have the organ close to the gut, attached to the liver by certain extremely fine ducts. The bonito has the gall-bladder stretched alongside the gut and equalling it in length, and often a double fold of it. others have the organ in the region of the gut; in some cases far off, in others near; as the fishing-frog, the elops, the synagris, the muraena, and the sword-fish. Often animals of the same species show this diversity of position; as, for instance, some congers are found with the organ attached close to the liver, and others with it detached from and below it. The case is much the same with birds: that is, some have the gall-bladder close to the stomach, and others close to the gut, as the pigeon, the raven, the quail, the swallow, and the sparrow; some have it near at once to the liver and to the stomach as the aegocephalus; others have it near at once to the liver and the gut, as the falcon and the kite.

16

Again, all viviparous quadrupeds are furnished with kidneys and a bladder. Of the ovipara that are not quadrupedal there is no instance known of an animal, whether fish or bird, provided with these organs. Of the ovipara that are quadrupedal, the turtle alone is provided with these organs of a magnitude to correspond with the other organs of the animal. In the turtle the kidney resembles the same organ in the ox; that is to say, it looks one single organ composed of a number of small ones. (The bison also resembles the ox in all its internal parts).

17

With all animals that are furnished with these parts, the parts are similarly situated, and with the exception of man, the heart is in the middle; in man, however, as has been observed, the heart is placed a little to the left-hand side. In all animals the pointed end of the heart turns frontwards; only in fish it would at first sight seem otherwise, for the pointed end is turned not towards the breast, but towards the head and the mouth. And (in fish) the apex is attached to a tube just where the right and left gills meet together. There are other ducts extending from the heart to each of the gills, greater in the greater fish, lesser in the lesser; but in the large fishes the duct at the pointed end of the heart is a tube, white-coloured and exceedingly thick. Fishes in some few cases have an oesophagus, as the conger and the eel; and in these the organ is small.

In fishes that are furnished with an undivided liver, the organ lies entirely on the right side; where the liver is cloven from the root, the larger half of the organ is on the right side: for in some fishes the two parts are detached from one another, without any coalescence at the root, as is the case with the dogfish. And there is also a species of hare in what is named the Fig district, near Lake Bolbe, and elsewhere, which animal might be taken to have two livers owing to the length of the connecting ducts, similar to the structure in the lung of birds.

The spleen in all cases, when normally placed, is on the left-hand side, and the kidneys also lie in the same position in all creatures that possess them. There have been known instances of quadrupeds under dissection, where the spleen was on the right hand and the liver on the left; but all such cases are regarded as supernatural.

In all animals the wind-pipe extends to the lung, and the manner how, we shall discuss hereafter; and the oesophagus, in all that have the organ, extends through the midriff into the stomach. For, by the way, as has been observed, most fishes have no oesophagus, but the stomach is united directly with the mouth, so that in some cases when big fish are pursuing little ones, the stomach tumbles forward into the mouth.

All the afore-mentioned animals have a stomach, and one similarly situated, that is to say, situated directly under the midriff; and they have a gut connected therewith and closing at the outlet of the residuum and at what is termed the ‘rectum’. However, animals present diversities in the structure of their stomachs. In the first place, of the viviparous quadrupeds, such of the horned animals as are not equally furnished with teeth in both jaws are furnished with four such chambers. These animals, by the way, are those that are said to chew the cud. In these animals the oesophagus extends from the mouth

downwards along the lung, from the midriff to the big stomach (or paunch); and this stomach is rough inside and semi-partitioned. And connected with it near to the entry of the oesophagus is what from its appearance is termed the 'reticulum' (or honeycomb bag); for outside it is like the stomach, but inside it resembles a netted cap; and the reticulum is a great deal smaller than the stomach. Connected with this is the 'echinus' (or many-plies), rough inside and laminated, and of about the same size as the reticulum. Next after this comes what is called the 'enystrum' (or abomasum), larger an longer than the echinus, furnished inside with numerous folds or ridges, large and smooth. After all this comes the gut.

Such is the stomach of those quadrupeds that are horned and have an unsymmetrical dentition; and these animals differ one from another in the shape and size of the parts, and in the fact of the oesophagus reaching the stomach centralwise in some cases and sideways in others. Animals that are furnished equally with teeth in both jaws have one stomach; as man, the pig, the dog, the bear, the lion, the wolf. (The Thos, by the by, has all its internal organs similar to the wolf's.)

All these, then have a single stomach, and after that the gut; but the stomach in some is comparatively large, as in the pig and bear, and the stomach of the pig has a few smooth folds or ridges; others have a much smaller stomach, not much bigger than the gut, as the lion, the dog, and man. In the other animals the shape of the stomach varies in the direction of one or other of those already mentioned; that is, the stomach in some animals resembles that of the pig; in others that of the dog, alike with the larger animals and the smaller ones. In all these animals diversities occur in regard to the size, the shape, the thickness or the thinness of the stomach, and also in regard to the place where the oesophagus opens into it.

There is also a difference in structure in the gut of the two groups of animals above mentioned (those with unsymmetrical and those with symmetrical dentition) in size, in thickness, and in foldings.

The intestines in those animals whose jaws are unequally furnished with teeth are in all cases the larger, for the animals themselves are larger than those in the other category; for very few of them are small, and no single one of the horned animals is very small. And some possess appendages (or caeca) to the gut, but no animal that has not incisors in both jaws has a straight gut.

The elephant has a gut constricted into chambers, so constructed that the animal appears to have four stomachs; in it the food is found, but there is no distinct and separate receptacle. Its viscera resemble those of the pig, only that the liver is four times the size of that of the ox, and the other viscera in like proportion, while the spleen is comparatively small.

Much the same may be predicated of the properties of the stomach and the gut in oviparous quadrupeds, as in the land tortoise, the turtle, the lizard, both crocodiles, and, in fact, in all animals of the like kind; that is to say, their stomach is one and simple, resembling in some cases that of the pig, and in other cases that of the dog.

The serpent genus is similar and in almost all respects furnished similarly to the saurians among land animals, if one could only imagine these saurians to be increased in length and to be devoid of legs. That is to say, the serpent is coated with tessellated scutes, and resembles the saurian in its back and belly; only, by the way, it has no testicles, but, like fishes, has two ducts converging into one, and an ovary long and bifurcate. The rest of its internal organs are identical with those of the

saurians, except that, owing to the narrowness and length of the animal, the viscera are correspondingly narrow and elongated, so that they are apt to escape recognition from the similarities in shape. Thus, the windpipe of the creature is exceptionally long, and the oesophagus is longer still, and the windpipe commences so close to the mouth that the tongue appears to be underneath it; and the windpipe seems to project over the tongue, owing to the fact that the tongue draws back into a sheath and does not remain in its place as in other animals. The tongue, moreover, is thin and long and black, and can be protruded to a great distance. And both serpents and saurians have this altogether exceptional property in the tongue, that it is forked at the outer extremity, and this property is the more marked in the serpent, for the tips of his tongue are as thin as hairs. The seal, also, by the way, has a split tongue.

The stomach of the serpent is like a more spacious gut, resembling the stomach of the dog; then comes the gut, long, narrow, and single to the end. The heart is situated close to the pharynx, small and kidney-shaped; and for this reason the organ might in some cases appear not to have the pointed end turned towards the breast. Then comes the lung, single, and articulated with a membranous passage, very long, and quite detached from the heart. The liver is long and simple; the spleen is short and round: as is the case in both respects with the saurians. Its gall resembles that of the fish; the water-snakes have it beside the liver, and the other snakes have it usually beside the gut. These creatures are all saw-toothed. Their ribs are as numerous as the days of the month; in other words, they are thirty in number.

Some affirm that the same phenomenon is observable with serpents as with swallow chicks; in other words, they say that if you prick out a serpent's eyes they will grow again. And further,

the tails of saurians and of serpents, if they be cut off, will grow again.

With fishes the properties of the gut and stomach are similar; that is, they have a stomach single and simple, but variable in shape according to species. For in some cases the stomach is gut-shaped, as with the scarus, or parrot-fish; which fish, by the way, appears to be the only fish that chews the cud. And the whole length of the gut is simple, and if it have a reduplication or kink it loosens out again into a simple form.

An exceptional property in fishes and in birds for the most part is the being furnished with gut-appendages or caeca. Birds have them low down and few in number. Fishes have them high up about the stomach, and sometimes numerous, as in the goby, the galeos, the perch, the scorpaena, the citharus, the red mullet, and the sparus; the cestreus or grey mullet has several of them on one side of the belly, and on the other side only one. Some fish possess these appendages but only in small numbers, as the hepatus and the glaucus; and, by the way, they are few also in the dorado. These fishes differ also from one another within the same species, for in the dorado one individual has many and another few. Some fishes are entirely without the part, as the majority of the selachians. As for all the rest, some of them have a few and some a great many. And in all cases where the gut-appendages are found in fish, they are found close up to the stomach.

In regard to their internal parts birds differ from other animals and from one another. Some birds, for instance, have a crop in front of the stomach, as the barn-door cock, the cushat, the pigeon, and the partridge; and the crop consists of a large hollow skin, into which the food first enters and where it lies ingested. Just where the crop leaves the oesophagus it is somewhat narrow; by and by it broadens out, but where it

communicates with the stomach it narrows down again. The stomach (or gizzard) in most birds is fleshy and hard, and inside is a strong skin which comes away from the fleshy part. Other birds have no crop, but instead of it an oesophagus wide and roomy, either all the way or in the part leading to the stomach, as with the daw, the raven, and the carrion-crow. The quail also has the oesophagus widened out at the lower extremity, and in the aegocephalus and the owl the organ is slightly broader at the bottom than at the top. The duck, the goose, the gull, the catarrhactes, and the great bustard have the oesophagus wide and roomy from one end to the other, and the same applies to a great many other birds. In some birds there is a portion of the stomach that resembles a crop, as in the kestrel. In the case of small birds like the swallow and the sparrow neither the oesophagus nor the crop is wide, but the stomach is long. Some few have neither a crop nor a dilated oesophagus, but the latter is exceedingly long, as in long necked birds, such as the porphyrio, and, by the way, in the case of all these birds the excrement is unusually moist. The quail is exceptional in regard to these organs, as compared with other birds; in other words, it has a crop, and at the same time its oesophagus is wide and spacious in front of the stomach, and the crop is at some distance, relatively to its size, from the oesophagus at that part.

Further, in most birds, the gut is thin, and simple when loosened out. The gut-appendages or caeca in birds, as has been observed, are few in number, and are not situated high up, as in fishes, but low down towards the extremity of the gut. Birds, then, have caeca – not all, but the greater part of them, such as the barn-door cock, the partridge, the duck, the night-raven, (the localus,) the ascalaphus, the goose, the swan, the great bustard, and the owl. Some of the little birds also have these appendages; but the caeca in their case are exceedingly minute, as in the sparrow.

Book III

1

Now that we have stated the magnitudes, the properties, and the relative differences of the other internal organs, it remains for us to treat of the organs that contribute to generation. These organs in the female are in all cases internal; in the male they present numerous diversities.

In the blooded animals some males are altogether devoid of testicles, and some have the organ but situated internally; and of those males that have the organ internally situated, some have it close to the loin in the neighbourhood of the kidney and others close to the belly. Other males have the organ situated externally. In the case of these last, the penis is in some cases attached to the belly, whilst in others it is loosely suspended, as is the case also with the testicles; and, in the cases where the penis is attached to the belly, the attachment varies accordingly as the animal is emprosthuretic or opisthuretic.

No fish is furnished with testicles, nor any other creature that has gills, nor any serpent whatever: nor, in short, any animal devoid of feet, save such only as are viviparous within themselves. Birds are furnished with testicles, but these are internally situated, close to the loin. The case is similar with oviparous quadrupeds, such as the lizard, the tortoise and the crocodile; and among the viviparous animals this peculiarity is

found in the hedgehog. Others among those creatures that have the organ internally situated have it close to the belly, as is the case with the dolphin amongst animals devoid of feet, and with the elephant among viviparous quadrupeds. In other cases these organs are externally conspicuous.

We have already alluded to the diversities observed in the attachment of these organs to the belly and the adjacent region; in other words, we have stated that in some cases the testicles are tightly fastened back, as in the pig and its allies, and that in others they are freely suspended, as in man.

Fishes, then, are devoid of testicles, as has been stated, and serpents also. They are furnished, however, with two ducts connected with the midriff and running on to either side of the backbone, coalescing into a single duct above the outlet of the residuum, and by 'above' the outlet I mean the region near to the spine. These ducts in the rutting season get filled with the genital fluid, and, if the ducts be squeezed, the sperm oozes out white in colour. As to the differences observed in male fishes of diverse species, the reader should consult my treatise on Anatomy, and the subject will be hereafter more fully discussed when we describe the specific character in each case.

The males of oviparous animals, whether biped or quadruped, are in all cases furnished with testicles close to the loin underneath the midriff. With some animals the organ is whitish, in others somewhat of a sallow hue; in all cases it is entirely enveloped with minute and delicate veins. From each of the two testicles extends a duct, and, as in the case of fishes, the two ducts coalesce into one above the outlet of the residuum. This constitutes the penis, which organ in the case of small ovipara is inconspicuous; but in the case of the larger ovipara, as in the goose and the like, the organ becomes quite visible just after copulation.

The ducts in the case of fishes and in biped and quadruped ovipara are attached to the loin under the stomach and the gut, in betwixt them and the great vein, from which ducts or blood-vessels extend, one to each of the two testicles. And just as with fishes the male sperm is found in the seminal ducts, and the ducts become plainly visible at the rutting season and in some instances become invisible after the season is passed, so also is it with the testicles of birds; before the breeding season the organ is small in some birds and quite invisible in others, but during the season the organ in all cases is greatly enlarged. This phenomenon is remarkably illustrated in the ring-dove and the partridge, so much so that some people are actually of opinion that these birds are devoid of the organ in the winter-time.

Of male animals that have their testicles placed frontwards, some have them inside, close to the belly, as the dolphin; some have them outside, exposed to view, close to the lower extremity of the belly. These animals resemble one another thus far in respect to this organ; but they differ from one another in this fact, that some of them have their testicles situated separately by themselves, while others, which have the organ situated externally, have them enveloped in what is termed the scrotum.

Again, in all viviparous animals furnished with feet the following properties are observed in the testicles themselves. From the aorta there extend vein-like ducts to the head of each of the testicles, and another two from the kidneys; these two from the kidneys are supplied with blood, while the two from the aorta are devoid of it. From the head of the testicle alongside of the testicle itself is a duct, thicker and more sinewy than the other just alluded to – a duct that bends back again at the end of the testicle to its head; and from the head of each of the two testicles the two ducts extend until they coalesce in front at the penis. The duct that bends back again and that

which is in contact with the testicle are enveloped in one and the same membrane, so that, until you draw aside the membrane, they present all the appearance of being a single undifferentiated duct. Further, the duct in contact with the testicle has its moist content qualified by blood, but to a comparatively less extent than in the case of the ducts higher up which are connected with the aorta; in the ducts that bend back towards the tube of the penis, the liquid is white-coloured. There also runs a duct from the bladder, opening into the upper part of the canal, around which lies, sheathwise, what is called the 'penis'.

All these descriptive particulars may be regarded by the light of the accompanying diagram; wherein the letter A marks the starting-point of the ducts that extend from the aorta; the letters KK mark the heads of the testicles and the ducts descending thereunto; the ducts extending from these along the testicles are marked MM; the ducts turning back, in which is the white fluid, are marked BB; the penis D; the bladder E; and the testicles XX.

(By the way, when the testicles are cut off or removed, the ducts draw upwards by contraction. Moreover, when male animals are young, their owner sometimes destroys the organ in them by attrition; sometimes they castrate them at a later period. And I may here add, that a bull has been known to serve a cow immediately after castration, and actually to impregnate her.)

So much then for the properties of testicles in male animals.

In female animals furnished with a womb, the womb is not in all cases the same in form or endowed with the same properties, but both in the vivipara and the ovipara great diversities present themselves. In all creatures that have the womb close to the genitals, the womb is two-horned, and one horn lies to the right-hand side and the other to the left; its

commencement, however, is single, and so is the orifice, resembling in the case of the most numerous and largest animals a tube composed of much flesh and gristle. Of these parts one is termed the hystera or delphys, whence is derived the word adelphos, and the other part, the tube or orifice, is termed metra. In all biped or quadruped vivipara the womb is in all cases below the midriff, as in man, the dog, the pig, the horse, and the ox; the same is the case also in all horned animals. At the extremity of the so-called ceratia, or horns, the wombs of most animals have a twist or convolution.

In the case of those ovipara that lay eggs externally, the wombs are not in all cases similarly situated. Thus the wombs of birds are close to the midriff, and the wombs of fishes down below, just like the wombs of biped and quadruped vivipara, only that, in the case of the fish, the wombs are delicately formed, membranous, and elongated; so much so that in extremely small fish, each of the two bifurcated parts looks like a single egg, and those fishes whose egg is described as crumbling would appear to have inside them a pair of eggs, whereas in reality each of the two sides consists not of one but of many eggs, and this accounts for their breaking up into so many particles.

The womb of birds has the lower and tubular portion fleshy and firm, and the part close to the midriff membranous and exceedingly thin and fine: so thin and fine that the eggs might seem to be outside the womb altogether. In the larger birds the membrane is more distinctly visible, and, if inflated through the tube, lifts and swells out; in the smaller birds all these parts are more indistinct.

The properties of the womb are similar in oviparous quadrupeds, as the tortoise, the lizard, the frog and the like; for the tube below is single and fleshy, and the cleft portion with

the eggs is at the top close to the midriff. With animals devoid of feet that are internally oviparous and viviparous externally, as is the case with the dogfish and the other so-called Selachians (and by this title we designate such creatures destitute of feet and furnished with gills as are viviparous), with these animals the womb is bifurcate, and beginning down below it extends as far as the midriff, as in the case of birds. There is also a narrow part between the two horns running up as far as the midriff, and the eggs are engendered here and above at the origin of the midriff; afterwards they pass into the wider space and turn from eggs into young animals. However, the differences in respect to the wombs of these fishes as compared with others of their own species or with fishes in general, would be more satisfactorily studied in their various forms in specimens under dissection.

The members of the serpent genus also present divergencies either when compared with the above-mentioned creatures or with one another. Serpents as a rule are oviparous, the viper being the only viviparous member of the genus. The viper is, previously to external parturition, oviparous internally; and owing to this perculiarity the properties of the womb in the viper are similar to those of the womb in the selachians. The womb of the serpent is long, in keeping with the body, and starting below from a single duct extends continuously on both sides of the spine, so as to give the impression of thus being a separate duct on each side of the spine, until it reaches the midriff, where the eggs are engendered in a row; and these eggs are laid not one by one, but all strung together. (And all animals that are viviparous both internally and externally have the womb situated above the stomach, and all the ovipara underneath, near to the loin. Animals that are viviparous externally and internally oviparous present an intermediate arrangement; for the underneath portion of the womb, in which

the eggs are, is placed near to the loin, but the part about the orifice is above the gut.)

Further, there is the following diversity observable in wombs as compared with one another: namely that the females of horned nonambidental animals are furnished with cotyledons in the womb when they are pregnant, and such is the case, among ambidentals, with the hare, the mouse, and the bat; whereas all other animals that are ambidental, viviparous, and furnished with feet, have the womb quite smooth, and in their case the attachment of the embryo is to the womb itself and not to any cotyledon inside it.

The parts, then, in animals that are not homogeneous with themselves and uniform in their texture, both parts external and parts internal, have the properties above assigned to them.

2

In sanguineous animals the homogeneous or uniform part most universally found is the blood, and its habitat the vein; next in degree of universality, their analogues, lymph and fibre, and, that which chiefly constitutes the frame of animals, flesh and whatsoever in the several parts is analogous to flesh; then bone, and parts that are analogous to bone, as fish-bone and gristle; and then, again, skin, membrane, sinew, hair, nails, and whatever corresponds to these; and, furthermore, fat, suet, and the excretions: and the excretions are dung, phlegm, yellow bile, and black bile.

Now, as the nature of blood and the nature of the veins have all the appearance of being primitive, we must discuss their properties first of all, and all the more as some previous writers

have treated them very unsatisfactorily. And the cause of the ignorance thus manifested is the extreme difficulty experienced in the way of observation. For in the dead bodies of animals the nature of the chief veins is undiscoverable, owing to the fact that they collapse at once when the blood leaves them; for the blood pours out of them in a stream, like liquid out of a vessel, since there is no blood separately situated by itself, except a little in the heart, but it is all lodged in the veins. In living animals it is impossible to inspect these parts, for of their very nature they are situated inside the body and out of sight. For this reason anatomists who have carried on their investigations on dead bodies in the dissecting room have failed to discover the chief roots of the veins, while those who have narrowly inspected bodies of living men reduced to extreme attenuation have arrived at conclusions regarding the origin of the veins from the manifestations visible externally. Of these investigators, Syennesis, the physician of Cyprus, writes as follows:

'The big veins run thus:-from the navel across the loins, along the back, past the lung, in under the breasts; one from right to left, and the other from left to right; that from the left, through the liver to the kidney and the testicle, that from the right, to the spleen and kidney and testicle, and from thence to the penis.' Diogenes of Apollonia writes thus:

'The veins in man are as follows: There are two veins pre-eminent in magnitude. These extend through the belly along the backbone, one to right, one to left; either one to the leg on its own side, and upwards to the head, past the collar bones, through the throat. From these, veins extend all over the body, from that on the right hand to the right side and from that on the left hand to the left side; the most important ones, two in number, to the heart in the region of the backbone; other two a little higher up through the chest in underneath the armpit,

each to the hand on its side: of these two, one being termed the vein splenitis, and the other the vein hepatitis. Each of the pair splits at its extremity; the one branches in the direction of the thumb and the other in the direction of the palm; and from these run off a number of minute veins branching off to the fingers and to all parts of the hand. Other veins, more minute, extend from the main veins; from that on the right towards the liver, from that on the left towards the spleen and the kidneys. The veins that run to the legs split at the juncture of the legs with the trunk and extend right down the thigh. The largest of these goes down the thigh at the back of it, and can be discerned and traced as a big one; the second one runs inside the thigh, not quite as big as the one just mentioned. After this they pass on along the knee to the shin and the foot (as the upper veins were described as passing towards the hands), and arrive at the sole of the foot, and from thence continue to the toes. Moreover, many delicate veins separate off from the great veins towards the stomach and towards the ribs.

'The veins that run through the throat to the head can be discerned and traced in the neck as large ones; and from each one of the two, where it terminates, there branch off a number of veins to the head; some from the right side towards the left, and some from the left side towards the right; and the two veins terminate near to each of the two ears. There is another pair of veins in the neck running along the big vein on either side, slightly less in size than the pair just spoken of, and with these the greater part of the veins in the head are connected. This other pair runs through the throat inside; and from either one of the two there extend veins in underneath the shoulder blade and towards the hands; and these appear alongside the veins splenitis and hepatitis as another pair of veins smaller in size. When there is a pain near the surface of the body, the physician lances these two latter veins; but when the pain is within and in the region of the stomach he lances the veins splenitis and

hepatitis. And from these, other veins depart to run below the breasts.

'There is also another pair running on each side through the spinal marrow to the testicles, thin and delicate. There is, further, a pair running a little underneath the cuticle through the flesh to the kidneys, and these with men terminate at the testicle, and with women at the womb. These veins are termed the spermatic veins. The veins that leave the stomach are comparatively broad just as they leave; but they become gradually thinner, until they change over from right to left and from left to right.

'Blood is thickest when it is imbibed by the fleshy parts; when it is transmitted to the organs above-mentioned, it becomes thin, warm, and frothy.'

3

Such are the accounts given by Syennesis and Diogenes. Polybus writes to the following effect:

'There are four pairs of veins. The first extends from the back of the head, through the neck on the outside, past the backbone on either side, until it reaches the loins and passes on to the legs, after which it goes on through the shins to the outer side of the ankles and on to the feet. And it is on this account that surgeons, for pains in the back and loin, bleed in the ham and in the outer side of the ankle. Another pair of veins runs from the head, past ears, through the neck; which veins are termed the jugular veins. This pair goes on inside along the backbone, past the muscles of the loins, on to the testicles, and onwards to the thighs, and through the inside of the hams and through the

shins down to the inside of the ankles and to the feet; and for this reason, surgeons, for pains in the muscles of the loins and in the testicles, bleed on the hams and the inner side of the ankles. The third pair extends from the temples, through the neck, in underneath the shoulder-blades, into the lung; those from right to left going in underneath the breast and on to the spleen and the kidney; those from left to right running from the lung in underneath the breast and into the liver and the kidney; and both terminate in the fundament. The fourth pair extend from the front part of the head and the eyes in underneath the neck and the collar-bones; from thence they stretch on through the upper part of the upper arms to the elbows and then through the fore-arms on to the wrists and the jointings of the fingers, and also through the lower part of the upper-arms to the armpits, and so on, keeping above the ribs, until one of the pair reaches the spleen and the other reaches the liver; and after this they both pass over the stomach and terminate at the penis.'

The above quotations sum up pretty well the statements of all previous writers. Furthermore, there are some writers on Natural History who have not ventured to lay down the law in such precise terms as regards the veins, but who all alike agree in assigning the head and the brain as the starting-point of the veins. And in this opinion they are mistaken.

The investigation of such a subject, as has been remarked, is one fraught with difficulties; but, if any one be keenly interested in the matter, his best plan will be to allow his animals to starve to emaciation, then to strangle them on a sudden, and thereupon to prosecute his investigations.

We now proceed to give particulars regarding the properties and functions of the veins. There are two blood-vessels in the thorax by the backbone, and lying to its inner side; and of these two

the larger one is situated to the front, and the lesser one is to the rear of it; and the larger is situated rather to the right hand side of the body, and the lesser one to the left; and by some this vein is termed the ‘aorta’, from the fact that even in dead bodies part of it is observed to be full of air. These blood-vessels have their origins in the heart, for they traverse the other viscera, in whatever direction they happen to run, without in any way losing their distinctive characteristic as blood-vessels, whereas the heart is as it were a part of them (and that too more in respect to the frontward and larger one of the two), owing to the fact that these two veins are above and below, with the heart lying midway.

The heart in all animals has cavities inside it. In the case of the smaller animals even the largest of the chambers is scarcely discernible; the second larger is scarcely discernible in animals of medium size; but in the largest animals all three chambers are distinctly seen. In the heart then (with its pointed end directed frontwards, as has been observed) the largest of the three chambers is on the right-hand side and highest up; the least one is on the left-hand side; and the medium-sized one lies in betwixt the other two; and the largest one of the three chambers is a great deal larger than either of the two others. All three, however, are connected with passages leading in the direction of the lung, but all these communications are indistinctly discernible by reason of their minuteness, except one.

The great blood-vessel, then, is attached to the biggest of the three chambers, the one that lies uppermost and on the right-hand side; it then extends right through the chamber, coming out as blood-vessel again; just as though the cavity of the heart were a part of the vessel, in which the blood broadens its channel as a river that widens out in a lake. The aorta is

attached to the middle chamber; only, by the way, it is connected with it by much narrower pipe.

The great blood-vessel then passes through the heart (and runs from the heart into the aorta). The great vessel looks as though made of membrane or skin, while the aorta is narrower than it, and is very sinewy; and as it stretches away to the head and to the lower parts it becomes exceedingly narrow and sinewy.

First of all, then, upwards from the heart there stretches a part of the great blood-vessel towards the lung and the attachment of the aorta, a part consisting of a large undivided vessel. But there split off from it two parts; one towards the lung and the other towards the backbone and the last vertebra of the neck.

The vessel, then, that extends to the lung, as the lung itself is duplicate, divides at first into two; and then extends along by every pipe and every perforation, greater along the greater ones, lesser along the less, so continuously that it is impossible to discern a single part wherein there is not perforation and vein; for the extremities are indistinguishable from their minuteness, and in point of fact the whole lung appears to be filled with blood.

The branches of the blood-vessels lie above the tubes that extend from the windpipe. And that vessel which extends to the vertebra of the neck and the backbone, stretches back again along the backbone; as Homer represents in the lines:

(Antilochus, as Thoon turned him round),

Transpierc'd his back with a dishonest wound;

The hollow vein that to the neck extends,

Along the chine, the eager javelin rends.

From this vessel there extend small blood-vessels at each rib and each vertebra; and at the vertebra above the kidneys the vessel bifurcates. And in the above way the parts branch off from the great blood-vessel.

But up above all these, from that part which is connected with the heart, the entire vein branches off in two directions. For its branches extend to the sides and to the collarbones, and then pass on, in men through the armpits to the arms, in quadrupeds to the forelegs, in birds to the wings, and in fishes to the upper or pectoral fins. (See diagram.) The trunks of these veins, where they first branch off, are called the 'jugular' veins; and, where they branch off to the neck the great vein run alongside the windpipe; and, occasionally, if these veins are pressed externally, men, though not actually choked, become insensible, shut their eyes, and fall flat on the ground. Extending in the way described and keeping the windpipe in betwixt them, they pass on until they reach the ears at the junction of the lower jaw with the skull. Hence again they branch off into four veins, of which one bends back and descends through the neck and the shoulder, and meets the previous branching off of the vein at the bend of the arm, while the rest of it terminates at the hand and fingers. (See diagram.)

Each vein of the other pair stretches from the region of the ear to the brain, and branches off in a number of fine and delicate veins into the so-called meninx, or membrane, which surrounds the brain. The brain itself in all animals is destitute of blood, and no vein, great or small, holds its course therein. But of the remaining veins that branch off from the last mentioned vein some envelop the head, others close their courses in the organs of sense and at the roots of the teeth in veins exceedingly fine and minute.

4

And in like manner the parts of the lesser one of the two chief blood-vessels, designated the aorta, branch off, accompanying the branches from the big vein; only that, in regard to the aorta, the passages are less in size, and the branches very considerably less than are those of the great vein. So much for the veins as observed in the regions above the heart.

The part of the great vein that lies underneath the heart extends, freely suspended, right through the midriff, and is united both to the aorta and the backbone by slack membranous communications. From it one vein, short and wide, extends through the liver, and from it a number of minute veins branch off into the liver and disappear. From the vein that passes through the liver two branches separate off, of which one terminates in the diaphragm or so-called midriff, and the other runs up again through the armpit into the right arm and unites with the other veins at the inside of the bend of the arm; and it is in consequence of this local connexion that, when the surgeon opens this vein in the forearm, the patient is relieved of certain pains in the liver; and from the left-hand side of it there extends a short but thick vein to the spleen and the little veins branching off it disappear in that organ. Another part branches off from the left-hand side of the great vein, and ascends, by a course similar to the course recently described, into the left arm; only that the ascending vein in the one case is the vein that traverses the liver, while in this case it is distinct from the vein that runs into the spleen. Again, other veins branch off from the big vein; one to the omentum, and another to the pancreas, from which vein run a number of veins through the mesentery. All these veins coalesce in a single large vein, along

the entire gut and stomach to the oesophagus; about these parts there is a great ramification of branch veins.

As far as the kidneys, each of the two remaining undivided, the aorta and the big vein extend; and here they get more closely attached to the backbone, and branch off, each of the two, into a A shape, and the big vein gets to the rear of the aorta. But the chief attachment of the aorta to the backbone takes place in the region of the heart; and the attachment is effected by means of minute and sinewy vessels. The aorta, just as it draws off from the heart, is a tube of considerable volume, but, as it advances in its course, it gets narrower and more sinewy. And from the aorta there extend veins to the mesentery just like the veins that extend thither from the big vein, only that the branches in the case of the aorta are considerably less in magnitude; they are, indeed, narrow and fibrillar, and they end in delicate hollow fibre-like veinlets.

There is no vessel that runs from the aorta into the liver or the spleen.

From each of the two great blood-vessels there extend branches to each of the two flanks, and both branches fasten on to the bone. Vessels also extend to the kidneys from the big vein and the aorta; only that they do not open into the cavity of the organ, but their ramifications penetrate into its substance. From the aorta run two other ducts to the bladder, firm and continuous; and there are other ducts from the hollow of the kidneys, in no way communicating with the big vein. From the centre of each of the two kidneys springs a hollow sinewy vein, running along the backbone right through the loins; by and by each of the two veins first disappears in its own flank, and soon afterwards reappears stretching in the direction of the flank. The extremities of these attach to the bladder, and also in the male to the penis and in the female to the womb. From the big

vein no vein extends to the womb, but the organ is connected with the aorta by veins numerous and closely packed.

Furthermore, from the aorta and the great vein at the points of divarication there branch off other veins. Some of these run to the groins – large hollow veins – and then pass on down through the legs and terminate in the feet and toes. And, again, another set run through the groins and the thighs cross-garter fashion, from right to left and from left to right, and unite in the hams with the other veins.

In the above description we have thrown light upon the course of the veins and their points of departure.

In all sanguineous animals the case stands as here set forth in regard to the points of departure and the courses of the chief veins. But the description does not hold equally good for the entire vein-system in all these animals. For, in point of fact, the organs are not identically situated in them all; and, what is more, some animals are furnished with organs of which other animals are destitute. At the same time, while the description so far holds good, the proof of its accuracy is not equally easy in all cases, but is easiest in the case of animals of considerable magnitude and supplied abundantly with blood. For in little animals and those scantily supplied with blood, either from natural and inherent causes or from a prevalence of fat in the body, thorough accuracy in investigation is not equally attainable; for in the latter of these creatures the passages get clogged, like water-channels choked with slush; and the others have a few minute fibres to serve instead of veins. But in all cases the big vein is plainly discernible, even in creatures of insignificant size.

5

The sinews of animals have the following properties. For these also the point of origin is the heart; for the heart has sinews within itself in the largest of its three chambers, and the aorta is a sinew-like vein; in fact, at its extremity it is actually a sinew, for it is there no longer hollow, and is stretched like the sinews where they terminate at the jointings of the bones. Be it remembered, however, that the sinews do not proceed in unbroken sequence from one point of origin, as do the blood-vessels.

For the veins have the shape of the entire body, like a sketch of a mannikin; in such a way that the whole frame seems to be filled up with little veins in attenuated subjects – for the space occupied by flesh in fat individuals is filled with little veins in thin ones – whereas the sinews are distributed about the joints and the flexures of the bones. Now, if the sinews were derived in unbroken sequence from a common point of departure, this continuity would be discernible in attenuated specimens.

In the ham, or the part of the frame brought into full play in the effort of leaping, is an important system of sinews; and another sinew, a double one, is that called 'the tendon', and others are those brought into play when a great effort of physical strength is required; that is to say, the epitonos or back-stay and the shoulder-sinews. Other sinews, devoid of specific designation, are situated in the region of the flexures of the bones; for all the bones that are attached to one another are bound together by sinews, and a great quantity of sinews are placed in the neighbourhood of all the bones. Only, by the way, in the head there is no sinew; but the head is held together by the sutures of the bones.

Sinew is fissile lengthwise, but crosswise it is not easily broken, but admits of a considerable amount of hard tension. In

connexion with sinews a liquid mucus is developed, white and glutinous, and the organ, in fact, is sustained by it and appears to be substantially composed of it. Now, vein may be submitted to the actual cautery, but sinew, when submitted to such action, shrivels up altogether; and, if sinews be cut asunder, the severed parts will not again cohere. A feeling of numbness is incidental only to parts of the frame where sinew is situated.

There is a very extensive system of sinews connected severally with the feet, the hands, the ribs, the shoulder-blades, the neck, and the arms.

All animals supplied with blood are furnished with sinews; but in the case of animals that have no flexures to their limbs, but are, in fact, destitute of either feet or hands, the sinews are fine and inconspicuous; and so, as might have been anticipated, the sinews in the fish are chiefly discernible in connexion with the fin.

6

The ines (or fibrous connective tissue) are a something intermediate between sinew and vein. Some of them are supplied with fluid, the lymph; and they pass from sinew to vein and from vein to sinew. There is another kind of ines or fibre that is found in blood, but not in the blood of all animals alike. If this fibre be left in the blood, the blood will coagulate; if it be removed or extracted, the blood is found to be incapable of coagulation. While, however, this fibrous matter is found in the blood of the great majority of animals, it is not found in all. For instance, we fail to find it in the blood of the deer, the roe, the antelope, and some other animals; and, owing to this deficiency of the fibrous tissue, the blood of these animals does not

coagulate to the extent observed in the blood of other animals. The blood of the deer coagulates to about the same extent as that of the hare: that is to the blood in either case coagulates, but not into a stiff or jelly-like substance, like the blood of ordinary animals, but only into a flaccid consistency like that of milk which is not subjected to the action of rennet. The blood of the antelope admits of a firmer consistency in coagulation; for in this respect it resembles, or only comes a little short of, the blood of sheep. Such are the properties of vein, sinew, and fibrous tissue.

7

The bones in animals are all connected with one single bone, and are interconnected, like the veins, in one unbroken sequence; and there is no instance of a bone standing apart by itself. In all animals furnished with bones, the spine or backbone is the point of origin for the entire osseous system. The spine is composed of vertebrae, and it extends from the head down to the loins. The vertebrae are all perforated, and, above, the bony portion of the head is connected with the topmost vertebrae, and is designated the ‘skull’. And the serrated lines on the skull are termed ‘sutures’.

The skull is not formed alike in all animals. In some animals the skull consists of one single undivided bone, as in the case of the dog; in others it is composite in structure, as in man; and in the human species the suture is circular in the female, while in the male it is made up of three separate sutures, uniting above in three-corner fashion; and instances have been known of a man’s skull being devoid of suture altogether. The skull is composed not of four bones, but of six; two of these are in the

region of the ears, small in comparison with the other four. From the skull extend the jaws, constituted of bone. (Animals in general move the lower jaw; the river crocodile is the only animal that moves the upper one.) In the jaws is the tooth-system; and the teeth are constituted of bone, and are half-way perforated; and the bone in question is the only kind of bone which it is found impossible to grave with a graving tool.

On the upper part of the course of the backbone are the collar-bones and the ribs. The chest rests on ribs; and these ribs meet together, whereas the others do not; for no animal has bone in the region of the stomach. Then come the shoulder-bones, or blade-bones, and the arm-bones connected with these, and the bones in the hands connected with the bones of the arms. With animals that have forelegs, the osseous system of the foreleg resembles that of the arm in man.

Below the level of the backbone, after the haunch-bone, comes the hip-socket; then the leg-bones, those in the thighs and those in the shins, which are termed colenes or limb-bones, a part of which is the ankle, while a part of the same is the so-called 'plectrum' in those creatures that have an ankle; and connected with these bones are the bones in the feet.

Now, with all animals that are supplied with blood and furnished with feet, and are at the same time viviparous, the bones do not differ greatly one from another, but only in the way of relative hardness, softness, or magnitude. A further difference, by the way, is that in one and the same animal certain bones are supplied with marrow, while others are destitute of it. Some animals might on casual observation appear to have no marrow whatsoever in their bones: as is the case with the lion, owing to his having marrow only in small amount, poor and thin, and in very few bones; for marrow is found in his thigh and armbones. The bones of the lion are

exceptionally hard; so hard, in fact, that if they are rubbed hard against one another they emit sparks like flint-stones. The dolphin has bones, and not fish-spine.

Of the other animals supplied with blood, some differ but little, as is the case with birds; others have systems analogous, as fishes; for viviparous fishes, such as the cartilaginous species, are gristle-spined, while the ovipara have a spine which corresponds to the backbone in quadrupeds. This exceptional property has been observed in fishes, that in some of them there are found delicate spines scattered here and there throughout the fleshy parts. The serpent is similarly constructed to the fish; in other words, his backbone is spinous. With oviparous quadrupeds, the skeleton of the larger ones is more or less osseous; of the smaller ones, more or less spinous. But all sanguineous animals have a backbone of either one kind or other: that is, composed either of bone or of spine.

The other portions of the skeleton are found in some animals and not found in others, but the presence or the absence of this and that part carries with it, as a matter of course, the presence or the absence of the bones or the spines corresponding to this or that part. For animals that are destitute of arms and legs cannot be furnished with limb-bones: and in like manner with animals that have the same parts, but yet have them unlike in form; for in these animals the corresponding bones differ from one another in the way of relative excess or relative defect, or in the way of analogy taking the place of identity. So much for the osseous or spinous systems in animals.

8

Gristle is of the same nature as bone, but differs from it in the way of relative excess or relative defect. And just like bone, cartilage also, if cut, does not grow again. In terrestrial viviparous sanguinea the gristle formations are unperforated, and there is no marrow in them as there is in bones; in the selachia, however – for, be it observed, they are gristle-spined – there is found in the case of the flat space in the region of the backbone, a gristle-like substance analogous to bone, and in this gristle-like substance there is a liquid resembling marrow. In viviparous animals furnished with feet, gristle formations are found in the region of the ears, in the nostrils, and around certain extremities of the bones.

9

Furthermore, there are parts of other kinds, neither identical with, nor altogether diverse from, the parts above enumerated: such as nails, hooves, claws, and horns; and also, by the way, beaks, such as birds are furnished with – all in the several animals that are furnished therewithal. All these parts are flexible and fissile; but bone is neither flexible nor fissile, but frangible.

And the colours of horns and nails and claw and hoof follow the colour of the skin and the hair. For according as the skin of an animal is black, or white, or of medium hue, so are the horns, the claws, or the hooves, as the case may be, of hue to match. And it is the same with nails. The teeth, however, follow after the bones. Thus in black men, such as the Aethiopians and the like, the teeth and bones are white, but the nails are black, like the whole of the skin.

Horns in general are hollow at their point of attachment to the bone which juts out from the head inside the horn, but they have a solid portion at the tip, and they are simple and undivided in structure. In the case of the stag alone of all animals the horns are solid throughout, and ramify into branches (or antlers). And, whereas no other animal is known to shed its horns, the deer sheds its horns annually, unless it has been castrated; and with regard to the effects of castration in animals we shall have much to say hereafter. Horns attach rather to the skin than to the bone; which will account for the fact that there are found in Phrygia and elsewhere cattle that can move their horns as freely as their ears.

Of animals furnished with nails – and, by the way, all animals have nails that have toes, and toes that have feet, except the elephant; and the elephant has toes undivided and slightly articulated, but has no nails whatsoever – of animals furnished with nails, some are straight-nailed, like man; others are crooked nailed, as the lion among animals that walk, and the eagle among animals that fly.

10

The following are the properties of hair and of parts analogous to hair, and of skin or hide. All viviparous animals furnished with feet have hair; all oviparous animals furnished with feet have horn-like tessellates; fishes, and fishes only, have scales – that is, such oviparous fishes as have the crumbling egg or roe. For of the lanky fishes, the conger has no such egg, nor the muraena, and the eel has no egg at all.

The hair differs in the way of thickness and fineness, and of length, according to the locality of the part in which it is found,

and according to the quality of skin or hide on which it grows. For, as a general rule, the thicker the hide, the harder and the thicker is the hair; and the hair is inclined to grow in abundance and to a great length in localities of the bodies hollow and moist, if the localities be fitted for the growth of hair at all. The facts are similar in the case of animals whether coated with scales or with tessellates. With soft-haired animals the hair gets harder with good feeding, and with hard-haired or bristly animals it gets softer and scantier from the same cause. Hair differs in quality also according to the relative heat or warmth of the locality: just as the hair in man is hard in warm places and soft in cold ones. Again, straight hair is inclined to be soft, and curly hair to be bristly.

11

Hair is naturally fissile, and in this respect it differs in degree in diverse animals. In some animals the hair goes on gradually hardening into bristle until it no longer resembles hair but spine, as in the case of the hedgehog. And in like manner with the nails; for in some animals the nail differs as regards solidity in no way from bone.

Of all animals man has the most delicate skin: that is, if we take into consideration his relative size. In the skin or hide of all animals there is a mucous liquid, scanty in some animals and plentiful in others, as, for instance, in the hide of the ox; for men manufacture glue out of it. (And, by the way, in some cases glue is manufactured from fishes also.) The skin, when cut, is in itself devoid of sensation; and this is especially the case with the skin on the head, owing to there being no flesh between it and the skull. And wherever the skin is quite by itself, if it be cut

asunder, it does not grow together again, as is seen in the thin part of the jaw, in the prepuce, and the eyelid. In all animals the skin is one of the parts that extends continuous and unbroken, and it comes to a stop only where the natural ducts pour out their contents, and at the mouth and nails.

All sanguineous animals, then, have skin; but not all such animals have hair, save only under the circumstances described above. The hair changes its colour as animals grow old, and in man it turns white or grey. With animals, in general, the change takes place, but not very obviously, or not so obviously as in the case of the horse. Hair turns grey from the point backwards to the roots. But, in the majority of cases, grey hairs are white from the beginning; and this is a proof that greyness of hair does not, as some believe to be the case, imply withering or decrepitude, for no part is brought into existence in a withered or decrepit condition.

In the eruptive malady called the white-sickness all the hairs get grey; and instances have been known where the hair became grey while the patients were ill of the malady, whereas the grey hairs shed off and black ones replaced them on their recovery. (Hair is more apt to turn grey when it is kept covered than when exposed to the action of the outer air.) In men, the hair over the temples is the first to turn grey, and the hair in the front grows grey sooner than the hair at the back; and the hair on the pubes is the last to change colour.

Some hairs are congenital, others grow after the maturity of the animal; but this occurs in man only. The congenital hairs are on the head, the eyelids, and the eyebrows; of the later growths the hairs on the pubes are the first to come, then those under the armpits, and, thirdly, those on the chin; for, singularly enough, the regions where congenital growths and the subsequent growths are found are equal in number. The hair on the head

grows scanty and sheds out to a greater extent and sooner than all the rest. But this remark applies only to hair in front; for no man ever gets bald at the back of his head. Smoothness on the top of the head is termed 'baldness', but smoothness on the eyebrows is denoted by a special term which means 'forehead-baldness'; and neither of these conditions of baldness supervenes in a man until he shall have come under the influence of sexual passion. For no boy ever gets bald, no woman, and no castrated man. In fact, if a man be castrated before reaching puberty, the later growths of hair never come at all; and, if the operation take place subsequently, the aftergrowths, and these only, shed off; or, rather, two of the growths shed off, but not that on the pubes.

Women do not grow hairs on the chin; except that a scanty beard grows on some women after the monthly courses have stopped; and similar phenomenon is observed at times in priestesses in Caria, but these cases are looked upon as portentous with regard to coming events. The other after-growths are found in women, but more scanty and sparse. Men and women are at times born constitutionally and congenitally incapable of the after-growths; and individuals that are destitute even of the growth upon the pubes are constitutionally impotent.

Hair as a rule grows more or less in length as the wearer grows in age; chiefly the hair on the head, then that in the beard, and fine hair grows longest of all. With some people as they grow old the eyebrows grow thicker, to such an extent that they have to be cut off; and this growth is owing to the fact that the eyebrows are situated at a conjuncture of bones, and these bones, as age comes on, draw apart and exude a gradual increase of moisture or rheum. The eyelashes do not grow in size, but they shed when the wearer comes first under the influence of sexual feelings, and shed all the quicker as this

influence is the more powerful; and these are the last hairs to grow grey.

Hairs if plucked out before maturity grow again; but they do not grow again if plucked out afterwards. Every hair is supplied with a mucous moisture at its root, and immediately after being plucked out it can lift light articles if it touch them with this mucus.

Animals that admit of diversity of colour in the hair admit of a similar diversity to start with in the skin and in the cuticle of the tongue.

In some cases among men the upper lip and the chin is thickly covered with hair, and in other cases these parts are smooth and the cheeks are hairy; and, by the way, smooth-chinned men are less inclined than bearded men to baldness.

The hair is inclined to grow in certain diseases, especially in consumption, and in old age, and after death; and under these circumstances the hair hardens concomitantly with its growth, and the same duplicate phenomenon is observable in respect of the nails.

In the case of men of strong sexual passions the congenital hairs shed the sooner, while the hairs of the after-growths are the quicker to come. When men are afflicted with varicose veins they are less inclined to take on baldness; and if they be bald when they become thus afflicted, they have a tendency to get their hair again.

If a hair be cut, it does not grow at the point of section; but it gets longer by growing upward from below. In fishes the scales grow harder and thicker with age, and when the amimal gets emaciated or is growing old the scales grow harder. In quadrupeds as they grow old the hair in some and the wool in others gets deeper but scantier in amount: and the hooves or

claws get larger in size; and the same is the case with the beaks of birds. The claws also increase in size, as do also the nails.

12

With regard to winged animals, such as birds, no creature is liable to change of colour by reason of age, excepting the crane. The wings of this bird are ash-coloured at first, but as it grows old the wings get black. Again, owing to special climatic influences, as when unusual frost prevails, a change is sometimes observed to take place in birds whose plumage is of one uniform colour; thus, birds that have dusky or downright black plumage turn white or grey, as the raven, the sparrow, and the swallow; but no case has ever yet been known of a change of colour from white to black. (Further, most birds change the colour of their plumage at different seasons of the year, so much so that a man ignorant of their habits might be mistaken as to their identity.) Some animals change the colour of their hair with a change in their drinking-water, for in some countries the same species of animal is found white in one district and black in another. And in regard to the commerce of the sexes, water in many places is of such peculiar quality that rams, if they have intercourse with the female after drinking it, beget black lambs, as is the case with the water of the Psychrus (so-called from its coldness), a river in the district of Assyritis in the Chalcidic Peninsula, on the coast of Thrace; and in Antandria there are two rivers of which one makes the lambs white and the other black. The river Scamander also has the reputation of making lambs yellow, and that is the reason, they say, why Homer designates it the 'Yellow River.' Animals as a general rule have no hair on their internal surfaces, and, in

regard to their extremities, they have hair on the upper, but not on the lower side.

The hare, or dasypod, is the only animal known to have hair inside its mouth and underneath its feet. Further, the so-called mousewhale instead of teeth has hairs in its mouth resembling pigs' bristles.

Hairs after being cut grow at the bottom but not at the top; if feathers be cut off, they grow neither at top nor bottom, but shed and fall out. Further, the bee's wing will not grow again after being plucked off, nor will the wing of any creature that has undivided wings. Neither will the sting grow again if the bee lose it, but the creature will die of the loss.

13

In all sanguineous animals membranes are found. And membrane resembles a thin close-textured skin, but its qualities are different, as it admits neither of cleavage nor of extension. Membrane envelops each one of the bones and each one of the viscera, both in the larger and the smaller animals; though in the smaller animals the membranes are indiscernible from their extreme tenuity and minuteness. The largest of all the membranes are the two that surround the brain, and of these two the one that lines the bony skull is stronger and thicker than the one that envelops the brain; next in order of magnitude comes the membrane that encloses the heart. If membrane be bared and cut asunder it will not grow together again, and the bone thus stripped of its membrane mortifies.

14

The omentum or caul, by the way, is membrane. All sanguineous animals are furnished with this organ; but in some animals the organ is supplied with fat, and in others it is devoid of it. The omentum has both its starting-point and its attachment, with ambidental vivipara, in the centre of the stomach, where the stomach has a kind of suture; in non-ambidental vivipara it has its starting-point and attachment in the chief of the ruminating stomachs.

15

The bladder also is of the nature of membrane, but of membrane peculiar in kind, for it is extensile. The organ is not common to all animals, but, while it is found in all the vivipara, the tortoise is the only oviparous animal that is furnished therewithal. The bladder, like ordinary membrane, if cut asunder will not grow together again, unless the section be just at the commencement of the urethra: except indeed in very rare cases, for instances of healing have been known to occur. After death, the organ passes no liquid excretion; but in life, in addition to the normal liquid excretion, it passes at times dry excretion also, which turns into stones in the case of sufferers from that malady. Indeed, instances have been known of concretions in the bladder so shaped as closely to resemble cockleshells.

Such are the properties, then, of vein, sinew and skin, of fibre and membrane, of hair, nail, claw and hoof, of horns, of teeth, of

beak, of gristle, of bones, and of parts that are analogous to any of the parts here enumerated.

16

Flesh, and that which is by nature akin to it in sanguineous animals, is in all cases situated in between the skin and the bone, or the substance analogous to bone; for just as spine is a counterpart of bone, so is the flesh-like substance of animals that are constructed a spinous system the counterpart of the flesh of animals constructed on an osseous one.

Flesh can be divided asunder in any direction, not lengthwise only as is the case with sinew and vein. When animals are subjected to emaciation the flesh disappears, and the creatures become a mass of veins and fibres; when they are over fed, fat takes the place of flesh. Where the flesh is abundant in an animal, its veins are somewhat small and the blood abnormally red; the viscera also and the stomach are diminutive; whereas with animals whose veins are large the blood is somewhat black, the viscera and the stomach are large, and the flesh is somewhat scanty. And animals with small stomachs are disposed to take on flesh.

17

Again, fat and suet differ from one another. Suet is frangible in all directions and congeals if subjected to extreme cold, whereas fat can melt but cannot freeze or congeal; and soups made of the flesh of animals supplied with fat do not congeal or

coagulate, as is found with horse-flesh and pork; but soups made from the flesh of animals supplied with suet do coagulate, as is seen with mutton and goat's flesh. Further, fat and suet differ as to their localities: for fat is found between the skin and flesh, but suet is found only at the limit of the fleshy parts. Also, in animals supplied with fat the omentum or caul is supplied with fat, and it is supplied with suet in animals supplied with suet. Moreover, ambidental animals are supplied with fat, and non-ambidentals with suet.

Of the viscera the liver in some animals becomes fatty, as, among fishes, is the case with the selachia, by the melting of whose livers an oil is manufactured. These cartilaginous fish themselves have no free fat at all in connexion with the flesh or with the stomach. The suet in fish is fatty, and does not solidify or congeal. All animals are furnished with fat, either intermingled with their flesh, or apart. Such as have no free or separate fat are less fat than others in stomach and omentum, as the eel; for it has only a scanty supply of suet about the omentum. Most animals take on fat in the belly, especially such animals as are little in motion.

The brains of animals supplied with fat are oily, as in the pig; of animals supplied with suet, parched and dry. But it is about the kidneys more than any other viscera that animals are inclined to take on fat; and the right kidney is always less supplied with fat than the left kidney, and, be the two kidneys ever so fat, there is always a space devoid of fat in between the two. Animals supplied with suet are specially apt to have it about the kidneys, and especially the sheep; for this animal is apt to die from its kidneys being entirely enveloped. Fat or suet about the kidney is superinduced by overfeeding, as is found at Leontini in Sicily; and consequently in this district they defer driving out sheep to pasture until the day is well on, with the view of limiting their food by curtailment of the hours of pasture.

18

The part around the pupil of the eye is fatty in all animals, and this part resembles suet in all animals that possess such a part and that are not furnished with hard eyes.

Fat animals, whether male or female, are more or less unfitted for breeding purposes. Animals are disposed to take on fat more when old than when young, and especially when they have attained their full breadth and their full length and are beginning to grow depthways.

19

And now to proceed to the consideration of the blood. In sanguineous animals blood is the most universal and the most indispensable part; and it is not an acquired or adventitious part, but it is a consubstantial part of all animals that are not corrupt or moribund. All blood is contained in a vascular system, to wit, the veins, and is found nowhere else, excepting in the heart. Blood is not sensitive to touch in any animal, any more than the excretions of the stomach; and the case is similar with the brain and the marrow. When flesh is lacerated, blood exudes, if the animal be alive and unless the flesh be gangrened. Blood in a healthy condition is naturally sweet to the taste, and red in colour, blood that deteriorates from natural decay or from disease more or less black. Blood at its best, before it undergoes deterioration from either natural decay or from disease, is neither very thick nor very thin. In the living

animal it is always liquid and warm, but, on issuing from the body, it coagulates in all cases except in the case of the deer, the roe, and the like animals; for, as a general rule, blood coagulates unless the fibres be extracted. Bull's blood is the quickest to coagulate.

Animals that are internally and externally viviparous are more abundantly supplied with blood than the sanguineous ovipara. Animals that are in good condition, either from natural causes or from their health having been attended to, have the blood neither too abundant – as creatures just after drinking have the liquid inside them in abundance – nor again very scanty, as is the case with animals when exceedingly fat. For animals in this condition have pure blood, but very little of it, and the fatter an animal gets the less becomes its supply of blood; for whatsoever is fat is destitute of blood.

A fat substance is incorruptible, but blood and all things containing it corrupt rapidly, and this property characterizes especially all parts connected with the bones. Blood is finest and purest in man; and thickest and blackest in the bull and the ass, of all vivipara. In the lower and the higher parts of the body blood is thicker and blacker than in the central parts.

Blood beats or palpitates in the veins of all animals alike all over their bodies, and blood is the only liquid that permeates the entire frames of living animals, without exception and at all times, as long as life lasts. Blood is developed first of all in the heart of animals before the body is differentiated as a whole. If blood be removed or if it escape in any considerable quantity, animals fall into a faint or swoon; if it be removed or if it escape in an exceedingly large quantity they die. If the blood get exceedingly liquid, animals fall sick; for the blood then turns into something like ichor, or a liquid so thin that it at times has been known to exude through the pores like sweat. In some

cases blood, when issuing from the veins, does not coagulate at all, or only here and there. Whilst animals are sleeping the blood is less abundantly supplied near the exterior surfaces, so that, if the sleeping creature be pricked with a pin, the blood does not issue as copiously as it would if the creature were awake. Blood is developed out of ichor by coction, and fat in like manner out of blood. If the blood get diseased, haemorrhoids may ensue in the nostril or at the anus, or the veins may become varicose. Blood, if it corrupt in the body, has a tendency to turn into pus, and pus may turn into a solid concretion.

Blood in the female differs from that in the male, for, supposing the male and female to be on a par as regards age and general health, the blood in the female is thicker and blacker than in the male; and with the female there is a comparative superabundance of it in the interior. Of all female animals the female in man is the most richly supplied with blood, and of all female animals the menstruous discharges are the most copious in woman. The blood of these discharges under disease turns into flux. Apart from the menstrual discharges, the female in the human species is less subject to diseases of the blood than the male.

Women are seldom afflicted with varicose veins, with haemorrhoids, or with bleeding at the nose, and, if any of these maladies supervene, the menses are imperfectly discharged.

Blood differs in quantity and appearance according to age; in very young animals it resembles ichor and is abundant, in the old it is thick and black and scarce, and in middle-aged animals its qualities are intermediate. In old animals the blood coagulates rapidly, even blood at the surface of the body; but this is not the case with young animals. Ichor is, in fact, nothing else but unconcocted blood: either blood that has not yet been concocted, or that has become fluid again.

20

We now proceed to discuss the properties of marrow; for this is one of the liquids found in certain sanguineous animals. All the natural liquids of the body are contained in vessels: as blood in veins, marrow in bones other moistures in membranous structures of the skin

In young animals the marrow is exceedingly sanguineous, but, as animals grow old, it becomes fatty in animals supplied with fat, and suet-like in animals with suet. All bones, however, are not supplied with marrow, but only the hollow ones, and not all of these. For of the bones in the lion some contain no marrow at all, and some are only scantily supplied therewith; and that accounts, as was previously observed, for the statement made by certain writers that the lion is marrowless. In the bones of pigs it is found in small quantities; and in the bones of certain animals of this species it is not found at all.

These liquids, then, are nearly always congenital in animals, but milk and sperm come at a later time. Of these latter, that which, whensoever it is present, is secreted in all cases ready-made, is the milk; sperm, on the other hand, is not secreted out in all cases, but in some only, as in the case of what are designated thori in fishes.

Whatever animals have milk, have it in their breasts. All animals have breasts that are internally and externally viviparous, as for instance all animals that have hair, as man and the horse; and the cetaceans, as the dolphin, the porpoise, and the whale – for these animals have breasts and are supplied with milk. Animals that are oviparous or only externally

viviparous have neither breasts nor milk, as the fish and the bird.

All milk is composed of a watery serum called 'whey', and a consistent substance called curd (or cheese); and the thicker the milk, the more abundant the curd. The milk, then, of non-ambidentals coagulates, and that is why cheese is made of the milk of such animals under domestication; but the milk of ambidentals does not coagulate, nor their fat either, and the milk is thin and sweet. Now the camel's milk is the thinnest, and that of the human species next after it, and that of the ass next again, but cow's milk is the thickest. Milk does not coagulate under the influence of cold, but rather runs to whey; but under the influence of heat it coagulates and thickens. As a general rule milk only comes to animals in pregnancy. When the animal is pregnant milk is found, but for a while it is unfit for use, and then after an interval of usefulness it becomes unfit for use again. In the case of female animals not pregnant a small quantity of milk has been procured by the employment of special food, and cases have been actually known where women advanced in years on being submitted to the process of milking have produced milk, and in some cases have produced it in sufficient quantities to enable them to suckle an infant.

The people that live on and about Mount Oeta take such she-goats as decline the male and rub their udders hard with nettles to cause an irritation amounting to pain; hereupon they milk the animals, procuring at first a liquid resembling blood, then a liquid mixed with purulent matter, and eventually milk, as freely as from females submitting to the male.

As a general rule, milk is not found in the male of man or of any other animal, though from time to time it has been found in a male; for instance, once in Lemnos a he-goat was milked by its dugs (for it has, by the way, two dugs close to the penis), and

was milked to such effect that cheese was made of the produce, and the same phenomenon was repeated in a male of its own begetting. Such occurrences, however, are regarded as supernatural and fraught with omen as to futurity, and in point of fact when the Lemnian owner of the animal inquired of the oracle, the god informed him that the portent foreshadowed the acquisition of a fortune. With some men, after puberty, milk can be produced by squeezing the breasts; cases have been known where on their being subjected to a prolonged milking process a considerable quantity of milk has been educed.

In milk there is a fatty element, which in clotted milk gets to resemble oil. Goat's milk is mixed with sheep's milk in Sicily, and wherever sheep's milk is abundant. The best milk for clotting is not only that where the cheese is most abundant, but that also where the cheese is driest.

Now some animals produce not only enough milk to rear their young, but a superfluous amount for general use, for cheese-making and for storage. This is especially the case with the sheep and the goat, and next in degree with the cow. Mare's milk, by the way, and milk of the she-ass are mixed in with Phrygian cheese. And there is more cheese in cow's milk than in goat's milk; for graziers tell us that from nine gallons of goat's milk they can get nineteen cheeses at an obol apiece, and from the same amount of cow's milk, thirty. Other animals give only enough of milk to rear their young withal, and no superfluous amount and none fitted for cheese-making, as is the case with all animals that have more than two breasts or dugs; for with none of such animals is milk produced in superabundance or used for the manufacture of cheese.

The juice of the fig and rennet are employed to curdle milk. The fig-juice is first squeezed out into wool; the wool is then washed and rinsed, and the rinsing put into a little milk, and if this be

mixed with other milk it curdles Rennet is a kind of milk, for it is found in the stomach of the animal while it is yet suckling.

21

Rennet then consists of milk with an admixture of fire, which comes from the natural heat of the animal, as the milk is concocted. All ruminating animals produce rennet, and, of ambidentals, the hare. Rennet improves in quality the longer it is kept; and cow's rennet, after being kept a good while, and also hare's rennet, is good for diarrhoea, and the best of all rennet is that of the young deer.

In milk-producing animals the comparative amount of the yield varies with the size of the animal and the diversities of pasturage. For instance, there are in Phasis small cattle that in all cases give a copious supply of milk, and the large cows in Epirus yield each one daily some nine gallons of milk, and half of this from each pair of teats, and the milker has to stand erect, stooping forward a little, as otherwise, if he were seated, he would be unable to reach up to the teats. But, with the exception of the ass, all the quadrupeds in Epirus are of large size, and relatively, the cattle and the dogs are the largest. Now large animals require abundant pasture, and this country supplies just such pasturage, and also supplies diverse pasture grounds to suit the diverse seasons of the year. The cattle are particularly large, and likewise the sheep of the so-called Pyrrhic breed, the name being given in honour of King Pyrrhus.

Some pasture quenches milk, as Median grass or lucerne, and that especially in ruminants; other feeding renders it copious, as cytisus and vetch; only, by the way, cytisus in flower is not recommended, as it has burning properties, and vetch is not

good for pregnant kine, as it causes increased difficulty in parturition. However, beasts that have access to good feeding, as they are benefited thereby in regard to pregnancy, so also being well nourished produce milk in plenty. Some of the leguminous plants bring milk in abundance, as for instance, a large feed of beans with the ewe, the common she-goat, the cow, and the small she-goat; for this feeding makes them drop their udders. And, by the way, the pointing of the udder to the ground before parturition is a sign of there being plenty of milk coming.

Milk remains for a long time in the female, if she be kept from the male and be properly fed, and, of quadrupeds, this is especially true of the ewe; for the ewe can be milked for eight months. As a general rule, ruminating animals give milk in abundance, and milk fitted for cheese manufacture. In the neighbourhood of Torone cows run dry for a few days before calving, and have milk all the rest of the time. In women, milk of a livid colour is better than white for nursing purposes; and swarthy women give healthier milk than fair ones. Milk that is richest in cheese is the most nutritious, but milk with a scanty supply of cheese is the more wholesome for children.

22

All sanguineous animals eject sperm. As to what, and how, it contributes to generation, these questions will be discussed in another treatise. Taking the size of his body into account, man emits more sperm than any other animal. In hairy-coated animals the sperm is sticky, but in other animals it is not so. It is white in all cases, and Herodotus is under a misapprehension when he states that the Aethiopians eject black sperm.

Sperm issues from the body white and consistent, if it be healthy, and after quitting the body becomes thin and black. In frosty weather it does not coagulate, but gets exceedingly thin and watery both in colour and consistency; but it coagulates and thickens under the influence of heat. If it be long in the womb before issuing out, it comes more than usually thick; and sometimes it comes out dry and compact. Sperm capable of impregnating or of fructification sinks in water; sperm incapable Of producing that result dissolves away. But there is no truth in what Ctesias has written about the sperm of the elephant.

Book IV

1

We have now treated, in regard to blooded animals of the parts they have in common and of the parts peculiar to this genus or that, and of the parts both composite and simple, whether without or within. We now proceed to treat of animals devoid of blood. These animals are divided into several genera.

One genus consists of so-called 'molluscs'; and by the term 'mollusc' we mean an animal that, being devoid of blood, has its flesh-like substance outside, and any hard structure it may happen to have, inside – in this respect resembling the red – blooded animals, such as the genus of the cuttle-fish.

Another genus is that of the malacostraca. These are animals that have their hard structure outside, and their soft or fleshlike substance inside, and the hard substance belonging to them has to be crushed rather than shattered; and to this genus belongs the crawfish and the crab.

A third genus is that of the ostracoderms or 'testaceans'. These are animals that have their hard substance outside and their flesh-like substance within, and their hard substance can be shattered but not crushed; and to this genus belong the snail and the oyster.

The fourth genus is that of insects; and this genus comprehends numerous and dissimilar species. Insects are creatures that, as the name implies, have nicks either on the belly or on the back, or on both belly and back, and have no one part distinctly osseous and no one part distinctly fleshy, but are throughout a something intermediate between bone and flesh; that is to say, their body is hard all through, inside and outside. Some insects are wingless, such as the iulus and the centipede; some are winged, as the bee, the cockchafer, and the wasp; and the same kind is in some cases both winged and wingless, as the ant and the glow-worm.

In molluscs the external parts are as follows: in the first place, the so-called feet; secondly, and attached to these, the head; thirdly, the mantle-sac, containing the internal parts, and incorrectly designated by some writers the head; and, fourthly, fins round about the sac. (See diagram.) In all molluscs the head is found to be between the feet and the belly. All molluscs are furnished with eight feet, and in all cases these feet are severally furnished with a double row of suckers, with the exception of one single species of poulpe or octopus. The sepia, the small calamary and the large calamary have an exceptional organ in a pair of long arms or tentacles, having at their

extremities a portion rendered rough by the presence of two rows of suckers; and with these arms or tentacles they apprehend their food and draw it into their mouths, and in stormy weather they cling by them to a rock and sway about in the rough water like ships lying at anchor. They swim by the aid of the fins that they have about the sac. In all cases their feet are furnished with suckers.

The octopus, by the way, uses his feelers either as feet or hands; with the two which stand over his mouth he draws in food, and the last of his feelers he employs in the act of copulation; and this last one, by the way, is extremely sharp, is exceptional as being of a whitish colour, and at its extremity is bifurcate; that is to say, it has an additional something on the rachis, and by rachis is meant the smooth surface or edge of the arm on the far side from the suckers. (See diagram.)

In front of the sac and over the feelers they have a hollow tube, by means of which they discharge any sea-water that they may have taken into the sac of the body in the act of receiving food by the mouth. They can shift the tube from side to side, and by means of it they discharge the black liquid peculiar to the animal.

Stretching out its feet, it swims obliquely in the direction of the so-called head, and by this mode of swimming it can see in front, for its eyes are at the top, and in this attitude it has its mouth at the rear. The 'head', while the creature is alive, is hard, and looks as though it were inflated. It apprehends and retains objects by means of the under-surface of its arms, and the membrane in between its feet is kept at full tension; if the animal get on to the sand it can no longer retain its hold.

There is a difference between the octopus and the other molluscs above mentioned: the body of the octopus is small, and his feet are long, whereas in the others the body is large

and the feet short; so short, in fact, that they cannot walk on them. Compared with one another, the teuthis, or calamary, is long-shaped, and the sepia flat-shaped; and of the calamaries the so-called teuthus is much bigger than the teuthis; for teuthi have been found as much as five ells long. Some sepiae attain a length of two ells, and the feelers of the octopus are sometimes as long, or even longer. The species teuthus is not a numerous one; the teuthus differs from the teuthis in shape; that is, the sharp extremity of the teuthus is broader than that of the other, and, further, the encircling fin goes all round the trunk, whereas it is in part lacking in the teuthis; both animals are pelagic.

In all cases the head comes after the feet, in the middle of the feet that are called arms or feelers. There is here situated a mouth, and two teeth in the mouth; and above these two large eyes, and betwixt the eyes a small cartilage enclosing a small brain; and within the mouth it has a minute organ of a fleshy nature, and this it uses as a tongue, for no other tongue does it possess. Next after this, on the outside, is what looks like a sac; the flesh of which it is made is divisible, not in long straight strips, but in annular flakes; and all molluscs have a cuticle around this flesh. Next after or at the back of the mouth comes a long and narrow oesophagus, and close after that a crop or craw, large and spherical, like that of a bird; then comes the stomach, like the fourth stomach in ruminants; and the shape of it resembles the spiral convolution in the trumpet-shell; from the stomach there goes back again, in the direction of the mouth, thin gut, and the gut is thicker than the oesophagus. (See diagram.)

Molluscs have no viscera, but they have what is called a mytis, and on it a vessel containing a thick black juice; in the sepia or cuttle-fish this vessel is the largest, and this juice is most abundant. All molluscs, when frightened, discharge such a juice, but the discharge is most copious in the cuttle-fish. The mytis,

then, is situated under the mouth, and the oesophagus runs through it; and down below at the point to which the gut extends is the vesicle of the black juice, and the animal has the vesicle and the gut enveloped in one and the same membrane, and by the same membrane, same orifice discharges both the black juice and the residuum. The animals have also certain hair-like or furry growths in their bodies.

In the sepia, the teuthis, and the teuthus the hard parts are within, towards the back of the body; those parts are called in one the sepium, and in the other the 'sword'. They differ from one another, for the sepium in the cuttle-fish and teuthus is hard and flat, being a substance intermediate between bone and fishbone, with (in part) a crumbling, spongy texture, but in the teuthis the part is thin and somewhat gristly. These parts differ from one another in shape, as do also the bodies of the animals. The octopus has nothing hard of this kind in its interior, but it has a gristly substance round the head, which, if the animal grows old, becomes hard.

The females differ from the males. The males have a duct in under the oesophagus, extending from the mantle-cavity to the lower portion of the sac, and there is an organ to which it attaches, resembling a breast; (see diagram) in the female there are two of these organs, situated higher up; (see diagram) with both sexes there are underneath these organs certain red formations. The egg of the octopus is single, uneven on its surface, and of large size; the fluid substance within is all uniform in colour, smooth, and in colour white; the size of the egg is so great as to fill a vessel larger than the creature's head. The sepia has two sacs, and inside them a number of eggs, like in appearance to white hailstones. For the disposition of these parts I must refer to my anatomical diagrams.

The males of all these animals differ from the females, and the difference between the sexes is most marked in the sepia; for the back of the trunk, which is blacker than the belly, is rougher in the male than in the female, and in the male the back is striped, and the rump is more sharply pointed.

There are several species of the octopus. One keeps close to the surface, and is the largest of them all, and near the shore the size is larger than in deep water; and there are others, small, variegated in colour, which are not articles of food. There are two others, one called the heledone, which differs from its congeners in the length of its legs and in having one row of suckers – all the rest of the molluscs having two, – the other nicknamed variously the bolitaina or the 'onion,' and the ozolis or the 'stinkard'.

There are two others found in shells resembling those of the testaceans. One of them is nicknamed by some persons the nautilus or the pontilus, or by others the 'polypus' egg'; and the shell of this creature is something like a separate valve of a deep scallop-shell. This polypus lives very often near to the shore, and is apt to be thrown up high and dry on the beach; under these circumstances it is found with its shell detached, and dies by and by on dry land. These polypods are small, and are shaped, as regards the form of their bodies, like the bolbidia. There is another polypus that is placed within a shell like a snail; it never comes out of the shell, but lives inside the shell like the snail, and from time to time protrudes its feelers.

So much for molluscs.

2

With regard to the Malacostraca or crustaceans, one species is that of the crawfish, and a second, resembling the first, is that of the lobster; the lobster differing from the crawfish in having claws, and in a few other respects as well. Another species is that of the carid, and another is that of the crab, and there are many kinds both of carid and of crab.

Of carids there are the so-called cyphae, or 'hunch-backs', the crangons, or squillae, and the little kind, or shrimps, and the little kind do not develop into a larger kind.

Of the crab, the varieties are indefinite and incalculable. The largest of all crabs is one nicknamed Maia, a second variety is the pagarus and the crab of Heracleotis, and a third variety is the fresh-water crab; the other varieties are smaller in size and destitute of special designations. In the neighbourhood of Phoenice there are found on the beach certain crabs that are nicknamed the 'horsemen', from their running with such speed that it is difficult to overtake them; these crabs, when opened, are usually found empty, and this emptiness may be put down to insufficiency of nutriment. (There is another variety, small like the crab, but resembling in shape the lobster.) All these animals, as has been stated, have their hard and shelly part outside, where the skin is in other animals, and the fleshy part inside; and the belly is more or less provided with lamellae, or little flaps, and the female here deposits her spawn.

The crawfishes have five feet on either side, including the claws at the end; and in like manner the crabs have ten feet in all, including the claws. Of the carids, the hunch-backed, or prawns, have five feet on either side, which are sharp-pointed – those towards the head; and five others on either side in the region of the belly, with their extremities flat; they are devoid of flaps on the under side such as the crawfish has, but on the back they

resemble the crawfish. (See diagram.)It is very different with the crangon, or squilla; it has four front legs on either side, then three thin ones close behind on either side, and the rest of the body is for the most part devoid of feet. (See diagram.) Of all these animals the feet bend out obliquely, as is the case with insects; and the claws, where claws are found, turn inwards. The crawfish has a tail, and five fins on it; and the round-backed carid has a tail and four fins; the squilla also has fins at the tail on either side. In the case of both the hump-backed carid and the squilla the middle art of the tail is spinous: only that in the squilla the part is flattened and in the carid it is sharp-pointed. Of all animals of this genus the crab is the only one devoid of a rump; and, while the body of the carid and the crawfish is elongated, that of the crab is rotund.

In the crawfish the male differs from the female: in the female the first foot is bifurcate, in the male it is undivided; the belly-fins in the female are large and overlapping on the neck, while in the male they are smaller and do not overlap; and, further, on the last feet of the male there are spur-like projections, large and sharp, which projections in the female are small and smooth. Both male and female have two antennae in front of the eyes, large and rough, and other antennae underneath, small and smooth. The eyes of all these creatures are hard and beady, and can move either to the inner or to the outer side. The eyes of most crabs have a similar facility of movement, or rather, in the crab this facility is developed in a higher degree. (See diagram.)

The lobster is all over grey-coloured, with a mottling of black. Its under or hinder feet, up to the big feet or claws, are eight in number; then come the big feet, far larger and flatter at the tips than the same organs in the crawfish; and these big feet or claws are exceptional in their structure, for the right claw has the extreme flat surface long and thin, while the left claw has

the corresponding surface thick and round. Each of the two claws, divided at the end like a pair of jaws, has both below and above a set of teeth: only that in the right claw they are all small and saw-shaped, while in the left claw those at the apex are saw-shaped and those within are molar-shaped, these latter being, in the under part of the cleft claw, four teeth close together, and in the upper part three teeth, not close together. Both right and left claws have the upper part mobile, and bring it to bear against the lower one, and both are curved like bandy-legs, being thereby adapted for apprehension and constriction. Above the two large claws come two others, covered with hair, a little underneath the mouth; and underneath these the gill-like formations in the region of the mouth, hairy and numerous. These organs the animal keeps in perpetual motion; and the two hairy feet it bends and draws in towards its mouth. The feet near the mouth are furnished also with delicate outgrowing appendages. Like the crawfish, the lobster has two teeth, or mandibles, and above these teeth are its antennae, long, but shorter and finer by far than those of the crawfish, and then four other antennae similar in shape, but shorter and finer than the others. Over these antennae come the eyes, small and short, not large like the eyes of the crawfish. Over the eyes is a peaky rough projection like a forehead, larger than the same part in the crawfish; in fact, the frontal part is more pointed and the thorax is much broader in the lobster than in the crawfish, and the body in general is smoother and more full of flesh. Of the eight feet, four are bifurcate at the extremities, and four are undivided. The region of the so-called neck is outwardly divided into five divisions, and sixthly comes the flattened portion at the end, and this portion has five flaps, or tail-fins; and the inner or under parts, into which the female drops her spawn, are four in number and hairy, and on each of the aforesaid parts is a spine turned outwards, short and straight. The body in general and the region of the thorax in particular are smooth,

not rough as in the crawfish; but on the large claws the outer portion has larger spines. There is no apparent difference between the male and female, for they both have one claw, whichever it may be, larger than the other, and neither male nor female is ever found with both claws of the same size.

All crustaceans take in water close by the mouth. The crab discharges it, closing up, as it does so, a small portion of the same, and the crawfish discharges it by way of the gills; and, by the way, the gill-shaped organs in the crawfish are very numerous.

The following properties are common to all crustaceans: they have in all cases two teeth, or mandibles (for the front teeth in the crawfish are two in number), and in all cases there is in the mouth a small fleshy structure serving for a tongue; and the stomach is close to the mouth, only that the crawfish has a little oesophagus in front of the stomach, and there is a straight gut attached to it. This gut, in the crawfish and its congeners, and in the carids, extends in a straight line to the tail, and terminates where the animal discharges the residuum, and where the female deposits her spawn; in the crab it terminates where the flap is situated, and in the centre of the flap. (And by the way, in all these animals the spawn is deposited outside.) Further, the female has the place for the spawn running along the gut. And, again, all these animals have, more or less, an organ termed the 'mytis', or 'poppyjuice'.

We must now proceed to review their several differentiae.

The crawfish then, as has been said, has two teeth, large and hollow, in which is contained a juice resembling the mytis, and in between the teeth is a fleshy substance, shaped like a tongue. After the mouth comes a short oesophagus, and then a membranous stomach attached to the oesophagus, and at the orifice Of the stomach are three teeth, two facing one another

and a third standing by itself underneath. Coming off at a bend from the stomach is a gut, simple and of equal thickness throughout the entire length of the body until it reaches the anal vent.

These are all common properties of the crawfish, the carid, and the crab; for the crab, be it remembered, has two teeth.

Again, the crawfish has a duct attached all the way from the chest to the anal vent; and this duct is connected with the ovary in the female, and with the seminal ducts in the male. This passage is attached to the concave surface of the flesh in such a way that the flesh is in betwixt the duct and the gut; for the gut is related to the convexity and this duct to the concavity, pretty much as is observed in quadrupeds. And the duct is identical in both the sexes; that is to say, the duct in both is thin and white, and charged with a sallow-coloured moisture, and is attached to the chest.

(The following are the properties of the egg and of the convolutes in the carid.)

The male, by the way, differs from the female in regard to its flesh, in having in connexion with the chest two separate and distinct white substances, resembling in colour and conformation the tentacles of the cuttle-fish, and they are convoluted like the 'poppy' or quasi-liver of the trumpet-shell. These organs have their starting-point in 'cotyledons' or papillae, which are situated under the hindmost feet; and hereabouts the flesh is red and blood-coloured, but is slippery to the touch and in so far unlike flesh. Off from the convolute organ at the chest branches off another coil about as thick as ordinary twine; and underneath there are two granular seminal bodies in juxta-position with the gut. These are the organs of the male. The female has red-coloured eggs, which are adjacent

to the stomach and to each side of the gut all along to the fleshy parts, being enveloped in a thin membrane.

Such are the parts, internal and external, of the carid.

3

The inner organs of sanguineous animals happen to have specific designations; for these animals have in all cases the inner viscera, but this is not the case with the bloodless animals, but what they have in common with red-blooded animals is the stomach, the oesophagus, and the gut.

With regard to the crab, it has already been stated that it has claws and feet, and their position has been set forth; furthermore, for the most part they have the right claw bigger and stronger than the left. It has also been stated' that in general the eyes of the crab look sideways. Further, the trunk of the crab's body is single and undivided, including its head and any other part it may possess. Some crabs have eyes placed sideways on the upper part, immediately under the back, and standing a long way apart, and some have their eyes in the centre and close together, like the crabs of Heracleotis and the so-called 'grannies'. The mouth lies underneath the eyes, and inside it there are two teeth, as is the case with the crawfish, only that in the crab the teeth are not rounded but long; and over the teeth are two lids, and in betwixt them are structures such as the crawfish has besides its teeth. The crab takes in water near by the mouth, using the lids as a check to the inflow, and discharges the water by two passages above the mouth, closing by means of the lids the way by which it entered; and the two passage-ways are underneath the eyes. When it has taken in water it closes its mouth by means of both lids, and

ejects the water in the way above described. Next after the teeth comes the oesophagus, very short, so short in fact that the stomach seems to come straightway after the mouth. Next after the oesophagus comes the stomach, two-horned, to the centre of which is attached a simple and delicate gut; and the gut terminates outwards, at the operculum, as has been previously stated. (The crab has the parts in between the lids in the neighbourhood of the teeth similar to the same parts in the crawfish.) Inside the trunk is a sallow juice and some few little bodies, long and white, and others spotted red. The male differs from the female in size and breadth, and in respect of the ventral flap; for this is larger in the female than in the male, and stands out further from the trunk, and is more hairy (as is the case also with the female in the crawfish).

So much, then, for the organs of the malacostraca or crustacea.

4

With the ostracoderma, or testaceans, such as the land-snails and the sea-snails, and all the 'oysters' so-called, and also with the sea-urchin genus, the fleshy part, in such as have flesh, is similarly situated to the fleshy part in the crustaceans; in other words, it is inside the animal, and the shell is outside, and there is no hard substance in the interior. As compared with one another the testaceans present many diversities both in regard to their shells and to the flesh within. Some of them have no flesh at all, as the sea-urchin; others have flesh, but it is inside and wholly hidden, except the head, as in the land-snails, and the so-called cocalia, and, among pelagic animals, in the purple murex, the ceryx or trumpet-shell, the sea-snail, and the spiral-shaped testaceans in general. Of the rest, some are bivalved and

some univalved; and by ‘bivalves’ I mean such as are enclosed within two shells, and by ‘univalved’ such as are enclosed within a single shell, and in these last the fleshy part is exposed, as in the case of the limpet. Of the bivalves, some can open out, like the scallop and the mussel; for all such shells are grown together on one side and are separate on the other, so as to open and shut. Other bivalves are closed on both sides alike, like the solen or razor-fish. Some testaceans there are, that are entirely enveloped in shell and expose no portion of their flesh outside, as the tethya or ascidians.

Again, in regard to the shells themselves, the testaceans present differences when compared with one another. Some are smooth-shelled, like the solen, the mussel, and some clams, viz. those that are nicknamed ‘milkshells’, while others are rough-shelled, such as the pool-oyster or edible oyster, the pinna, and certain species of cockles, and the trumpet shells; and of these some are ribbed, such as the scallop and a certain kind of clam or cockle, and some are devoid of ribs, as the pinna and another species of clam. Testaceans also differ from one another in regard to the thickness or thinness of their shell, both as regards the shell in its entirety and as regards specific parts of the shell, for instance, the lips; for some have thin-lipped shells, like the mussel, and others have thick-lipped shells, like the oyster. A property common to the above mentioned, and, in fact, to all testaceans, is the smoothness of their shells inside. Some also are capable of motion, like the scallop, and indeed some aver that scallops can actually fly, owing to the circumstance that they often jump right out of the apparatus by means of which they are caught; others are incapable of motion and are attached fast to some external object, as is the case with the pinna. All the spiral-shaped testaceans can move and creep, and even the limpet relaxes its hold to go in quest of food. In the case of the univalves and the bivalves, the fleshy substance adheres to the shell so tenaciously that it can only be removed

by an effort; in the case of the stromboids, it is more loosely attached. And a peculiarity of all the stromboids is the spiral twist of the shell in the part farthest away from the head; they are also furnished from birth with an operculum. And, further, all stromboid testaceans have their shells on the right hand side, and move not in the direction of the spire, but the opposite way. Such are the diversities observed in the external parts of these animals.

The internal structure is almost the same in all these creatures, and in the stromboids especially; for it is in size that these latter differ from one another, and in accidents of the nature of excess or defect. And there is not much difference between most of the univalves and bivalves; but, while those that open and shut differ from one another but slightly, they differ considerably from such as are incapable of motion. And this will be illustrated more satisfactorily hereafter.

The spiral-shaped testaceans are all similarly constructed, but differ from one another, as has been said, in the way of excess or defect (for the larger species have larger and more conspicuous organs, and the smaller have smaller and less conspicuous), and, furthermore, in relative hardness or softness, and in other such accidents or properties. All the stromboids, for instance, have the flesh that extrudes from the mouth of the shell, hard and stiff; some more, and some less. From the middle of this protrudes the head and two horns, and these horns are large in the large species, but exceedingly minute in the smaller ones. The head protrudes from them all in the same way; and, if the animal be alarmed, the head draws in again. Some of these creatures have a mouth and teeth, as the snail; teeth sharp, and small, and delicate. They have also a proboscis just like that of the fly; and the proboscis is tongue-shaped. The ceryx and the purple murex have this organ firm and solid; and just as the myops, or horse-fly, and the oestrus, or gadfly, can

pierce the skin of a quadruped, so is that proboscis proportionately stronger in these testaceans; for they bore right through the shells of other shell-fish on which they prey. The stomach follows close upon the mouth, and, by the way, this organ in the snail resembles a bird's crop. Underneath come two white firm formations, mastoid or papillary in form; and similar formations are found in the cuttle-fish also, only that they are of a firmer consistency in the cuttle-fish. After the stomach comes an oesophagus, simple and long, extending to the poppy or quasi-liver, which is in the innermost recess of the shell. All these statements may be verified in the case of the purple murex and the ceryx by observation within the whorl of the shell. What comes next to the oesophagus is the gut; in fact, the gut is continuous with the oesophagus, and runs its whole length uncomplicated to the outlet of the residuum. The gut has its point of origin in the region of the coil of the mecon, or so-called 'poppy', and is wider hereabouts (for remember, the mecon is for the most part a sort of excretion in all testaceans); it then takes a bend and runs up again towards the fleshy part, and terminates by the side of the head, where the animal discharges its residuum; and this holds good in the case of all stromboid testaceans, whether terrestrial or marine. From the stomach there is drawn in a parallel direction with the oesophagus, in the larger snails, a long white duct enveloped in a membrane, resembling in colour the mastoid formations higher up; and in it are nicks or interruptions, as in the egg-mass of the crawfish, only, by the way, the duct of which we are treating is white and the egg-mass of the crawfish is red. This formation has no outlet nor duct, but is enveloped in a thin membrane with a narrow cavity in its interior. And from the gut downward extend black and rough formations, in close connexion, something like the formations in the tortoise, only not so black. Marine snails, also, have these formations, and the

white ones, only that the formations are smaller in the smaller species.

The non-spiral univalves and bivalves are in some respect similar in construction, and in some respects dissimilar, to the spiral testaceans. They all have a head and horns, and a mouth, and the organ resembling a tongue; but these organs, in the smaller species, are indiscernible owing to the minuteness of these animals, and some are indiscernible even in the larger species when dead, or when at rest and motionless. They all have the mecon, or poppy, but not all in the same place, nor of equal size, nor similarly open to observation; thus, the limpets have this organ deep down in the bottom of the shell, and the bivalves at the hinge connecting the two valves. They also have in all cases the hairy growths or beards, in a circular form, as in the scallops. And, with regard to the so-called 'egg', in those that have it, when they have it, it is situated in one of the semicircles of the periphery, as is the case with the white formation in the snail; for this white formation in the snail corresponds to the so-called egg of which we are speaking. But all these organs, as has been stated, are distinctly traceable in the larger species, while in the small ones they are in some cases almost, and in others altogether, indiscernible. Hence they are most plainly visible in the large scallops; and these are the bivalves that have one valve flat-shaped, like the lid of a pot. The outlet of the excretion is in all these animals (save for the exception to be afterwards related) on one side; for there is a passage whereby the excretion passes out. (And, remember, the mecon or poppy, as has been stated, is an excretion in all these animals – an excretion enveloped in a membrane.) The so-called egg has no outlet in any of these creatures, but is merely an excrescence in the fleshy mass; and it is not situated in the same region with the gut, but the 'egg' is situated on the right-hand side and the gut on the left. Such are the relations of the anal vent in most of these animals; but in the case of the wild limpet (called by some

the 'sea-ear'), the residuum issues beneath the shell, for the shell is perforated to give an outlet. In this particular limpet the stomach is seen coming after the mouth, and the egg-shaped formations are discernible. But for the relative positions of these parts you are referred to my Treatise on Anatomy.

The so-called carcinium or hermit crab is in a way intermediate between the crustaceans and the testaceans. In its nature it resembles the crawfish kind, and it is born simple of itself, but by its habit of introducing itself into a shell and living there it resembles the testaceans, and so appears to partake of the characters of both kinds. In shape, to give a simple illustration, it resembles a spider, only that the part below the head and thorax is larger in this creature than in the spider. It has two thin red horns, and underneath these horns two long eyes, not retreating inwards, nor turning sideways like the eyes of the crab, but protruding straight out; and underneath these eyes the mouth, and round about the mouth several hair-like growths, and next after these two bifurcate legs or claws, whereby it draws in objects towards itself, and two other legs on either side, and a third small one. All below the thorax is soft, and when opened in dissection is found to be sallow-coloured within. From the mouth there runs a single passage right on to the stomach, but the passage for the excretions is not discernible. The legs and the thorax are hard, but not so hard as the legs and the thorax of the crab. It does not adhere to its shell like the purple murex and the ceryx, but can easily slip out of it. It is longer when found in the shell of the stromboids than when found in the shell of the neritae.

And, by the way, the animal found in the shell of the neritae is a separate species, like to the other in most respects; but of its bifurcate feet or claws, the right-hand one is small and the left-hand one is large, and it progresses chiefly by the aid of this latter and larger one. (In the shells of these animals, and in

certain others, there is found a parasite whose mode of attachment is similar. The particular one which we have just described is named the cyllarus.)

The nerites has a smooth large round shell, and resembles the ceryx in shape, only the poppy-juice is, in its case, not black but red. It clings with great force near the middle. In calm weather, then, they go free afield, but when the wind blows the carcinia take shelter against the rocks: the neritae themselves cling fast like limpets; and the same is the case with the haemorrhoid or aporrhaid and all others of the like kind. And, by the way, they cling to the rock, when they turn back their operculum, for this operculum seems like a lid; in fact this structure represents the one part, in the stromboids, of that which in the bivalves is a duplicate shell. The interior of the animal is fleshy, and the mouth is inside. And it is the same with the haemorrhoid, the purple murex, and all suchlike animals.

Such of the little crabs as have the left foot or claw the bigger of the two are found in the neritae, but not in the stromboids. are some snail-shells which have inside them creatures resembling those little crayfish that are also found in fresh water. These creatures, however, differ in having the part inside the shells But as to the characters, you are referred to my Treatise on Anatomy.

5

The urchins are devoid of flesh, and this is a character peculiar to them; and while they are in all cases empty and devoid of any flesh within, they are in all cases furnished with the black formations. There are several species of the urchin, and one of these is that which is made use of for food; this is the kind in

which are found the so-called eggs, large and edible, in the larger and smaller specimens alike; for even when as yet very small they are provided with them. There are two other species, the spatangus, and the so-called bryssus, these animals are pelagic and scarce. Further, there are the echinometrae, or 'mother-urchins', the largest in size of all the species. In addition to these there is another species, small in size, but furnished with large hard spines; it lives in the sea at a depth of several fathoms; and is used by some people as a specific for cases of strangury. In the neighbourhood of Torone there are sea-urchins of a white colour, shells, spines, eggs and all, and that are longer than the ordinary sea-urchin. The spine in this species is not large nor strong, but rather limp; and the black formations in connexion with the mouth are more than usually numerous, and communicate with the external duct, but not with one another; in point of fact, the animal is in a manner divided up by them. The edible urchin moves with greatest freedom and most often; and this is indicated by the fact that these urchins have always something or other on their spines.

All urchins are supplied with eggs, but in some of the species the eggs are exceedingly small and unfit for food. Singularly enough, the urchin has what we may call its head and mouth down below, and a place for the issue of the residuum up above; (and this same property is common to all stromboids and to limpets). For the food on which the creature lives lies down below; consequently the mouth has a position well adapted for getting at the food, and the excretion is above, near to the back of the shell. The urchin has, also, five hollow teeth inside, and in the middle of these teeth a fleshy substance serving the office of a tongue. Next to this comes the oesophagus, and then the stomach, divided into five parts, and filled with excretion, all the five parts uniting at the anal vent, where the shell is perforated for an outlet. Underneath the stomach, in another membrane, are the so-called eggs, identical in number in all

cases, and that number is always an odd number, to wit five. Up above, the black formations are attached to the starting-point of the teeth, and they are bitter to the taste, and unfit for food. A similar or at least an analogous formation is found in many animals; as, for instance, in the tortoise, the toad, the frog, the stromboids, and, generally, in the molluscs; but the formation varies here and there in colour, and in all cases is altogether uneatable, or more or less unpalatable. In reality the mouth-apparatus of the urchin is continuous from one end to the other, but to outward appearance it is not so, but looks like a horn lantern with the panes of horn left out. The urchin uses its spines as feet; for it rests its weight on these, and then moving shifts from place to place.

6

The so-called tethyum or ascidian has of all these animals the most remarkable characteristics. It is the only mollusc that has its entire body concealed within its shell, and the shell is a substance intermediate between hide and shell, so that it cuts like a piece of hard leather. It is attached to rocks by its shell, and is provided with two passages placed at a distance from one another, very minute and hard to see, whereby it admits and discharges the sea-water; for it has no visible excretion (whereas of shell fish in general some resemble the urchin in this matter of excretion, and others are provided with the so-called mecon, or poppy-juice). If the animal be opened, it is found to have, in the first place, a tendinous membrane running round inside the shell-like substance, and within this membrane is the flesh-like substance of the ascidian, not resembling that in other molluscs; but this flesh, to which I now allude, is the same in all ascidia. And this substance is attached

in two places to the membrane and the skin, obliquely; and at the point of attachment the space is narrowed from side to side, where the fleshy substance stretches towards the passages that lead outwards through the shell; and here it discharges and admits food and liquid matter, just as it would if one of the passages were a mouth and the other an anal vent; and one of the passages is somewhat wider than the other Inside it has a pair of cavities, one on either side, a small partition separating them; and one of these two cavities contains the liquid. The creature has no other organ whether motor or sensory, nor, as was said in the case of the others, is it furnished with any organ connected with excretion, as other shell-fish are. The colour of the ascidian is in some cases sallow, and in other cases red.

There is, furthermore, the genus of the sea-nettles, peculiar in its way. The sea-nettle, or sea-anemone, clings to rocks like certain of the testaceans, but at times relaxes its hold. It has no shell, but its entire body is fleshy. It is sensitive to touch, and, if you put your hand to it, it will seize and cling to it, as the cuttlefish would do with its feelers, and in such a way as to make the flesh of your hand swell up. Its mouth is in the centre of its body, and it lives adhering to the rock as an oyster to its shell. If any little fish come up against it it it clings to it; in fact, just as I described it above as doing to your hand, so it does to anything edible that comes in its way; and it feeds upon sea-urchins and scallops. Another species of the sea-nettle roams freely abroad. The sea-nettle appears to be devoid altogether of excretion, and in this respect it resembles a plant.

Of sea-nettles there are two species, the lesser and more edible, and the large hard ones, such as are found in the neighbourhood of Chalcis. In winter time their flesh is firm, and accordingly they are sought after as articles of food, but in summer weather they are worthless, for they become thin and watery, and if you catch at them they break at once into bits,

and cannot be taken off the rocks entire; and being oppressed by the heat they tend to slip back into the crevices of the rocks.

So much for the external and the internal organs of molluscs, crustaceans, and testaceans.

7

We now proceed to treat of insects in like manner. This genus comprises many species, and, though several kinds are clearly related to one another, these are not classified under one common designation, as in the case of the bee, the drone, the wasp, and all such insects, and again as in the case of those that have their wings in a sheath or shard, like the cockchafer, the carabus or stag-beetle, the cantharis or blister-beetle, and the like.

Insects have three parts common to them all; the head, the trunk containing the stomach, and a third part in betwixt these two, corresponding to what in other creatures embraces chest and back. In the majority of insects this intermediate part is single; but in the long and multipedal insects it has practically the same number of segments as of nicks.

All insects when cut in two continue to live, excepting such as are naturally cold by nature, or such as from their minute size chill rapidly; though, by the way, wasps notwithstanding their small size continue living after severance. In conjunction with the middle portion either the head or the stomach can live, but the head cannot live by itself. Insects that are long in shape and many-footed can live for a long while after being cut in twain, and the severed portions can move in either direction, backwards or forwards; thus, the hinder portion, if cut off, can

crawl either in the direction of the section or in the direction of the tail, as is observed in the scolopendra.

All insects have eyes, but no other organ of sense discernible, except that some insects have a kind of a tongue corresponding to a similar organ common to all testaceans; and by this organ such insects taste and imbibe their food. In some insects this organ is soft; in other insects it is firm; as it is, by the way, in the purple-fish, among testaceans. In the horsefly and the gadfly this organ is hard, and indeed it is hard in most insects. In point of fact, such insects as have no sting in the rear use this organ as a weapon, (and, by the way, such insects as are provided with this organ are unprovided with teeth, with the exception of a few insects); the fly by a touch can draw blood with this organ, and the gnat can prick or sting with it.

Certain insects are furnished with prickers or stings. Some insects have the sting inside, as the bee and the wasp, others outside, as the scorpion; and, by the way, this is the only insect furnished with a long tail. And, further, the scorpion is furnished with claws, as is also the creature resembling a scorpion found within the pages of books.

In addition to their other organs, flying insects are furnished with wings. Some insects are dipterous or double-winged, as the fly; others are tetrapterous or furnished with four wings, as the bee; and, by the way, no insect with only two wings has a sting in the rear. Again, some winged insects have a sheath or shard for their wings, as the cockchafer; whereas in others the wings are unsheathed, as in the bee. But in the case of all alike, flight is in no way modified by tail-steerage, and the wing is devoid of quill-structure or division of any kind.

Again, some insects have antennae in front of their eyes, as the butterfly and the horned beetle. Such of them as have the power of jumping have the hinder legs the longer; and these long

hind-legs whereby they jump bend backwards like the hind-legs of quadrupeds. All insects have the belly different from the back; as, in fact, is the case with all animals. The flesh of an insect's body is neither shell-like nor is it like the internal substance of shell-covered animals, nor is it like flesh in the ordinary sense of the term; but it is a something intermediate in quality. Wherefore they have nor spine, nor bone, nor sepia-bone, nor enveloping shell; but their body by its hardness is its own protection and requires no extraneous support. However, insects have a skin; but the skin is exceedingly thin. These and such-like are the external organs of insects.

Internally, next after the mouth, comes a gut, in the majority of cases straight and simple down to the outlet of the residuum: but in a few cases the gut is coiled. No insect is provided with any viscera, or is supplied with fat; and these statements apply to all animals devoid of blood. Some have a stomach also, and attached to this the rest of the gut, either simple or convoluted as in the case of the acris or grasshopper.

The tettix or cicada, alone of such creatures (and, in fact, alone of all creatures), is unprovided with a mouth, but it is provided with the tongue-like formation found in insects furnished with frontward stings; and this formation in the cicada is long, continuous, and devoid of any split; and by the aid of this the creature feeds on dew, and on dew only, and in its stomach no excretion is ever found. Of the cicada there are several kinds, and they differ from one another in relative magnitude, and in this respect that the achetes or chirper is provided with a cleft or aperture under the hypozoma and has in it a membrane quite discernible, whilst the membrane is indiscernible in the tettigonia.

Furthermore, there are some strange creatures to be found in the sea, which from their rarity we are unable to classify.

Experienced fishermen affirm, some that they have at times seen in the sea animals like sticks, black, rounded, and of the same thickness throughout; others that they have seen creatures resembling shields, red in colour, and furnished with fins packed close together; and others that they have seen creatures resembling the male organ in shape and size, with a pair of fins in the place of the testicles, and they aver that on one occasion a creature of this description was brought up on the end of a nightline.

So much then for the parts, external and internal, exceptional and common, of all animals.

8

We now proceed to treat of the senses; for there are diversities in animals with regard to the senses, seeing that some animals have the use of all the senses, and others the use of a limited number of them. The total number of the senses (for we have no experience of any special sense not here included), is five: sight, hearing, smell, taste, and touch.

Man, then, and all vivipara that have feet, and, further, all red-blooded ovipara, appear to have the use of all the five senses, except where some isolated species has been subjected to mutilation, as in the case of the mole. For this animal is deprived of sight; it has no eyes visible, but if the skin – a thick one, by the way – be stripped off the head, about the place in the exterior where eyes usually are, the eyes are found inside in a stunted condition, furnished with all the parts found in ordinary eyes; that is to say, we find there the black rim, and the fatty part surrounding it; but all these parts are smaller than the same parts in ordinary visible eyes. There is no external sign

of the existence of these organs in the mole, owing to the thickness of the skin drawn over them, so that it would seem that the natural course of development were congenitally arrested; (for extending from the brain at its junction with the marrow are two strong sinewy ducts running past the sockets of the eyes, and terminating at the upper eye-teeth). All the other animals of the kinds above mentioned have a perception of colour and of sound, and the senses of smell and taste; the fifth sense, that, namely, of touch, is common to all animals whatsoever.

In some animals the organs of sense are plainly discernible; and this is especially the case with the eyes. For animals have a special locality for the eyes, and also a special locality for hearing: that is to say, some animals have ears, while others have the passage for sound discernible. It is the same with the sense of smell; that is to say, some animals have nostrils, and others have only the passages for smell, such as birds. It is the same also with the organ of taste, the tongue. Of aquatic red-blooded animals, fishes possess the organ of taste, namely the tongue, but it is in an imperfect and amorphous form, in other words it is osseous and undetached. In some fish the palate is fleshy, as in the fresh-water carp, so that by an inattentive observer it might be mistaken for a tongue.

There is no doubt but that fishes have the sense of taste, for a great number of them delight in special flavours; and fishes freely take the hook if it be baited with a piece of flesh from a tunny or from any fat fish, obviously enjoying the taste and the eating of food of this kind. Fishes have no visible organs for hearing or for smell; for what might appear to indicate an organ for smell in the region of the nostril has no communication with the brain. These indications, in fact, in some cases lead nowhere, like blind alleys, and in other cases lead only to the gills; but for all this fishes undoubtedly hear and smell. For they

are observed to run away from any loud noise, such as would be made by the rowing of a galley, so as to become easy of capture in their holes; for, by the way, though a sound be very slight in the open air, it has a loud and alarming resonance to creatures that hear under water. And this is shown in the capture of the dolphin; for when the hunters have enclosed a shoal of these fishes with a ring of their canoes, they set up from inside the canoes a loud splashing in the water, and by so doing induce the creatures to run in a shoal high and dry up on the beach, and so capture them while stupefied with the noise. And yet, for all this, the dolphin has no organ of hearing discernible. Furthermore, when engaged in their craft, fishermen are particularly careful to make no noise with oar or net; and after they have spied a shoal, they let down their nets at a spot so far off that they count upon no noise being likely to reach the shoal, occasioned either by oar or by the surging of their boats through the water; and the crews are strictly enjoined to preserve silence until the shoal has been surrounded. And, at times, when they want the fish to crowd together, they adopt the stratagem of the dolphin-hunter; in other words they clatter stones together, that the fish may, in their fright, gather close into one spot, and so they envelop them within their nets. (Before surrounding them, then, they preserve silence, as was said; but, after hemming the shoal in, they call on every man to shout out aloud and make any kind of noise; for on hearing the noise and hubbub the fish are sure to tumble into the nets from sheer fright.) Further, when fishermen see a shoal of fish feeding at a distance, disporting themselves in calm bright weather on the surface of the water, if they are anxious to descry the size of the fish and to learn what kind of a fish it is, they may succeed in coming upon the shoal whilst yet basking at the surface if they sail up without the slightest noise, but if any man make a noise previously, the shoal will be seen to scurry away in alarm. Again, there is a small river-fish called the

cottus or bullhead; this creature burrows under a rock, and fishers catch it by clattering stones against the rock, and the fish, bewildered at the noise, darts out of its hiding-place. From these facts it is quite obvious that fishes can hear; and indeed some people, from living near the sea and frequently witnessing such phenomena, affirm that of all living creatures the fish is the quickest of hearing. And, by the way, of all fishes the quickest of hearing are the cestreus or mullet, the chremps, the labrax or basse, the salpe or saupe, the chromis or sciaena, and such like. Other fishes are less quick of hearing, and, as might be expected, are more apt to be found living at the bottom of the sea.

The case is similar in regard to the sense of smell. Thus, as a rule, fishes will not touch a bait that is not fresh, neither are they all caught by one and the same bait, but they are severally caught by baits suited to their several likings, and these baits they distinguish by their sense of smell; and, by the way, some fishes are attracted by malodorous baits, as the saupe, for instance, is attracted by excrement. Again, a number of fishes live in caves; and accordingly fishermen, when they want to entice them out, smear the mouth of a cave with strong-smelling pickles, and the fish are Soon attracted to the smell. And the eel is caught in a similar way; for the fisherman lays down an earthen pot that has held pickles, after inserting a 'weel' in the neck thereof. As a general rule, fishes are especially attracted by savoury smells. For this reason, fishermen roast the fleshy parts of the cuttle-fish and use it as bait on account of its smell, for fish are peculiarly attracted by it; they also bake the octopus and bait their fish-baskets or weels with it, entirely, as they say, on account of its smell. Furthermore, gregarious fishes, if fish washings or bilge-water be thrown overboard, are observed to scud off to a distance, from apparent dislike of the smell. And it is asserted that they can at once detect by smell the presence of their own blood; and this faculty is manifested

by their hurrying off to a great distance whenever fish-blood is spilt in the sea. And, as a general rule, if you bait your weel with a stinking bait, the fish refuse to enter the weel or even to draw near; but if you bait the weel with a fresh and savoury bait, they come at once from long distances and swim into it. And all this is particularly manifest in the dolphin; for, as was stated, it has no visible organ of hearing, and yet it is captured when stupefied with noise; and so, while it has no visible organ for smell, it has the sense of smell remarkably keen. It is manifest, then, that the animals above mentioned are in possession of all the five senses.

All other animals may, with very few exceptions, be comprehended within four genera: to wit, molluscs, crustaceans, testaceans, and insects. Of these four genera, the mollusc, the crustacean, and the insect have all the senses: at all events, they have sight, smell, and taste. As for insects, both winged and wingless, they can detect the presence of scented objects afar off, as for instance bees and snipes detect the presence of honey at a distance; and do so recognizing it by smell. Many insects are killed by the smell of brimstone; ants, if the apertures to their dwellings be smeared with powdered origanum and brimstone, quit their nests; and most insects may be banished with burnt hart's horn, or better still by the burning of the gum styrax. The cuttle-fish, the octopus, and the crawfish may be caught by bait. The octopus, in fact, clings so tightly to the rocks that it cannot be pulled off, but remains attached even when the knife is employed to sever it; and yet, if you apply fleabane to the creature, it drops off at the very smell of it. The facts are similar in regard to taste. For the food that insects go in quest of is of diverse kinds, and they do not all delight in the same flavours: for instance, the bee never settles on a withered or wilted flower, but on fresh and sweet ones; and the conops or gnat settles only on acrid substances and not on sweet. The sense of touch, by the way, as has been remarked, is common to

all animals. Testaceans have the senses of smell and taste. With regard to their possession of the sense of smell, that is proved by the use of baits, e.g. in the case of the purple-fish; for this creature is enticed by baits of rancid meat, which it perceives and is attracted to from a great distance. The proof that it possesses a sense of taste hangs by the proof of its sense of smell; for whenever an animal is attracted to a thing by perceiving its smell, it is sure to like the taste of it. Further, all animals furnished with a mouth derive pleasure or pain from the touch of sapid juices.

With regard to sight and hearing, we cannot make statements with thorough confidence or on irrefutable evidence. However, the solen or razor-fish, if you make a noise, appears to burrow in the sand, and to hide himself deeper when he hears the approach of the iron rod (for the animal, be it observed, juts a little out of its hole, while the greater part of the body remains within), – and scallops, if you present your finger near their open valves, close them tight again as though they could see what you were doing. Furthermore, when fishermen are laying bait for neritae, they always get to leeward of them, and never speak a word while so engaged, under the firm impression that the animal can smell and hear; and they assure us that, if any one speaks aloud, the creature makes efforts to escape. With regard to testaceans, of the walking or creeping species the urchin appears to have the least developed sense of smell; and, of the stationary species, the ascidian and the barnacle.

So much for the organs of sense in the general run of animals. We now proceed to treat of voice.

9

Voice and sound are different from one another; and language differs from voice and sound. The fact is that no animal can give utterance to voice except by the action of the pharynx, and consequently such animals as are devoid of lung have no voice; and language is the articulation of vocal sounds by the instrumentality of the tongue. Thus, the voice and larynx can emit vocal or vowel sounds; non-vocal or consonantal sounds are made by the tongue and the lips; and out of these vocal and non-vocal sounds language is composed. Consequently, animals that have no tongue at all or that have a tongue not freely detached, have neither voice nor language; although, by the way, they may be enabled to make noises or sounds by other organs than the tongue.

Insects, for instance, have no voice and no language, but they can emit sound by internal air or wind, though not by the emission of air or wind; for no insects are capable of respiration. But some of them make a humming noise, like the bee and the other winged insects; and others are said to sing, as the cicada. And all these latter insects make their special noises by means of the membrane that is underneath the 'hypozoma' – those insects, that is to say, whose body is thus divided; as for instance, one species of cicada, which makes the sound by means of the friction of the air. Flies and bees, and the like, produce their special noise by opening and shutting their wings in the act of flying; for the noise made is by the friction of air between the wings when in motion. The noise made by grasshoppers is produced by rubbing or reverberating with their long hind-legs.

No mollusc or crustacean can produce any natural voice or sound. Fishes can produce no voice, for they have no lungs, nor windpipe and pharynx; but they emit certain inarticulate

sounds and squeaks, which is what is called their ‘voice’, as the lyra or gurnard, and the sciaena (for these fishes make a grunting kind of noise) and the caprus or boar-fish in the river Achelous, and the chalcis and the cuckoo-fish; for the chalcis makes a sort piping sound, and the cuckoo-fish makes a sound greatly like the cry of the cuckoo, and is nicknamed from the circumstance. The apparent voice in all these fishes is a sound caused in some cases by a rubbing motion of their gills, which by the way are prickly, or in other cases by internal parts about their bellies; for they all have air or wind inside them, by rubbing and moving which they produce the sounds. Some cartilaginous fish seem to squeak.

But in these cases the term ‘voice’ is inappropriate; the more correct expression would be ‘sound’. For the scallop, when it goes along supporting itself on the water, which is technically called ‘flying’, makes a whizzing sound; and so does the sea-swallow or flying-fish: for this fish flies in the air, clean out of the water, being furnished with fins broad and long. Just then as in the flight of birds the sound made by their wings is obviously not voice, so is it in the case of all these other creatures.

The dolphin, when taken out of the water, gives a squeak and moans in the air, but these noises do not resemble those above mentioned. For this creature has a voice (and can therefore utter vocal or vowel sounds), for it is furnished with a lung and a windpipe; but its tongue is not loose, nor has it lips, so as to give utterance to an articulate sound (or a sound of vowel and consonant in combination.)

Of animals which are furnished with tongue and lung, the oviparous quadrupeds produce a voice, but a feeble one; in some cases, a shrill piping sound, like the serpent; in others, a thin faint cry; in others, a low hiss, like the tortoise. The formation of the tongue in the frog is exceptional. The front part

of the tongue, which in other animals is detached, is tightly fixed in the frog as it is in all fishes; but the part towards the pharynx is freely detached, and may, so to speak, be spat outwards, and it is with this that it makes its peculiar croak. The croaking that goes on in the marsh is the call of the males to the females at rutting time; and, by the way, all animals have a special cry for the like end at the like season, as is observed in the case of goats, swine, and sheep. (The bull-frog makes its croaking noise by putting its under jaw on a level with the surface of the water and extending its upper jaw to its utmost capacity. The tension is so great that the upper jaw becomes transparent, and the animal's eyes shine through the jaw like lamps; for, by the way, the commerce of the sexes takes place usually in the night time.) Birds can utter vocal sounds; and such of them can articulate best as have the tongue moderately flat, and also such as have thin delicate tongues. In some cases, the male and the female utter the same note; in other cases, different notes. The smaller birds are more vocal and given to chirping than the larger ones; but in the pairing season every species of bird becomes particularly vocal. Some of them call when fighting, as the quail, others cry or crow when challenging to combat, as the partridge, or when victorious, as the barn-door cock. In some cases cock-birds and hens sing alike, as is observed in the nightingale, only that the hen stops singing when brooding or rearing her young; in other birds, the cocks sing more than the hens; in fact, with barn-door fowls and quails, the cock sings and the hen does not.

Viviparous quadrupeds utter vocal sounds of different kinds, but they have no power of converse. In fact, this power, or language, is peculiar to man. For while the capability of talking implies the capability of uttering vocal sounds, the converse does not hold good. Men that are born deaf are in all cases also dumb; that is, they can make vocal sounds, but they cannot speak. Children, just as they have no control over other parts, so

have no control, at first, over the tongue; but it is so far imperfect, and only frees and detaches itself by degrees, so that in the interval children for the most part lisp and stutter.

Vocal sounds and modes of language differ according to locality. Vocal sounds are characterized chiefly by their pitch, whether high or low, and the kinds of sound capable of being produced are identical within the limits of one and the same species; but articulate sound, that one might reasonably designate 'language', differs both in various animals, and also in the same species according to diversity of locality; as for instance, some partridges cackle, and some make a shrill twittering noise. Of little birds, some sing a different note from the parent birds, if they have been removed from the nest and have heard other birds singing; and a mother-nightingale has been observed to give lessons in singing to a young bird, from which spectacle we might obviously infer that the song of the bird was not equally congenital with mere voice, but was something capable of modification and of improvement. Men have the same voice or vocal sounds, but they differ from one another in speech or language.

The elephant makes a vocal sound of a windlike sort by the mouth alone, unaided by the trunk, just like the sound of a man panting or sighing; but, if it employ the trunk as well, the sound produced is like that of a hoarse trumpet.

10

With regard to the sleeping and waking of animals, all creatures that are red-blooded and provided with legs give sensible proof that they go to sleep and that they waken up from sleep; for, as a matter of fact, all animals that are furnished with eyelids shut

them up when they go to sleep. Furthermore, it would appear that not only do men dream, but horses also, and dogs, and oxen; aye, and sheep, and goats, and all viviparous quadrupeds; and dogs show their dreaming by barking in their sleep. With regard to oviparous animals we cannot be sure that they dream, but most undoubtedly they sleep. And the same may be said of water animals, such as fishes, molluscs, crustaceans, to wit crawfish and the like. These animals sleep without doubt, although their sleep is of very short duration. The proof of their sleeping cannot be got from the condition of their eyes – for none of these creatures are furnished with eyelids – but can be obtained only from their motionless repose.

Apart from the irritation caused by lice and what are nicknamed fleas, fish are met with in a state so motionless that one might easily catch them by hand; and, as a matter of fact, these little creatures, if the fish remain long in one position, will attack them in myriads and devour them. For these parasites are found in the depths of the sea, and are so numerous that they devour any bait made of fish's flesh if it be left long on the ground at the bottom; and fishermen often draw up a cluster of them, all clinging on to the bait.

But it is from the following facts that we may more reasonably infer that fishes sleep. Very often it is possible to take a fish off its guard so far as to catch hold of it or to give it a blow unawares; and all the while that you are preparing to catch or strike it, the fish is quite still but for a slight motion of the tail. And it is quite obvious that the animal is sleeping, from its movements if any disturbance be made during its repose; for it moves just as you would expect in a creature suddenly awakened. Further, owing to their being asleep, fish may be captured by torchlight. The watchmen in the tunny-fishery often take advantage of the fish being asleep to envelop them in a circle of nets; and it is quite obvious that they were thus

sleeping by their lying still and allowing the glistening underparts of their bodies to become visible, while the capture is taking Place. They sleep in the night-time more than during the day; and so soundly at night that you may cast the net without making them stir. Fish, as a general rule, sleep close to the ground, or to the sand or to a stone at the bottom, or after concealing themselves under a rock or the ground. Flat fish go to sleep in the sand; and they can be distinguished by the outlines of their shapes in the sand, and are caught in this position by being speared with pronged instruments. The basse, the chrysophrys or gilt-head, the mullet, and fish of the like sort are often caught in the daytime by the prong owing to their having been surprised when sleeping; for it is scarcely probable that fish could be pronged while awake. Cartilaginous fish sleep at times so soundly that they may be caught by hand. The dolphin and the whale, and all such as are furnished with a blow-hole, sleep with the blow-hole over the surface of the water, and breathe through the blow-hole while they keep up a quiet flapping of their fins; indeed, some mariners assure us that they have actually heard the dolphin snoring.

Molluscs sleep like fishes, and crustaceans also. It is plain also that insects sleep; for there can be no mistaking their condition of motionless repose. In the bee the fact of its being asleep is very obvious; for at night-time bees are at rest and cease to hum. But the fact that insects sleep may be very well seen in the case of common every-day creatures; for not only do they rest at night-time from dimness of vision (and, by the way, all hard-eyed creatures see but indistinctly), but even if a lighted candle be presented they continue sleeping quite as soundly.

Of all animals man is most given to dreaming. Children and infants do not dream, but in most cases dreaming comes on at the age of four or five years. Instances have been known of full-grown men and women that have never dreamed at all; in

exceptional cases of this kind, it has been observed that when a dream occurs in advanced life it prognosticates either actual dissolution or a general break-up of the system.

So much then for sensation and for the phenomena of sleeping and of awakening.

11

With regard to sex, some animals are divided into male and female, but others are not so divided but can only be said in a comparative way to bring forth young and to be pregnant. In animals that live confined to one spot there is no duality of sex; nor is there such, in fact, in any testaceans. In molluscs and in crustaceans we find male and female: and, indeed, in all animals furnished with feet, biped or quadruped; in short, in all such as by copulation engender either live young or egg or grub. In the several genera, with however certain exceptions, there either absolutely is or absolutely is not a duality of sex. Thus, in quadrupeds the duality is universal, while the absence of such duality is universal in testaceans, and of these creatures, as with plants, some individuals are fruitful and some are not their lying still

But among insects and fishes, some cases are found wholly devoid of this duality of sex. For instance, the eel is neither male nor female, and can engender nothing. In fact, those who assert that eels are at times found with hair-like or worm-like progeny attached, make only random assertions from not having carefully noticed the locality of such attachments. For no eel nor animal of this kind is ever viviparous unless previously oviparous; and no eel was ever yet seen with an egg. And animals that are viviparous have their young in the womb and

closely attached, and not in the belly; for, if the embryo were kept in the belly, it would be subjected to the process of digestion like ordinary food. When people rest duality of sex in the eel on the assertion that the head of the male is bigger and longer, and the head of the female smaller and more snubbed, they are taking diversity of species for diversity of sex.

There are certain fish that are nicknamed the epitragiae, or capon-fish, and, by the way, fish of this description are found in fresh water, as the carp and the balagrus. This sort of fish never has either roe or milt; but they are hard and fat all over, and are furnished with a small gut; and these fish are regarded as of super-excellent quality.

Again, just as in testaceans and in plants there is what bears and engenders, but not what impregnates, so is it, among fishes, with the psetta, the erythrinus, and the channe; for these fish are in all cases found furnished with eggs.

As a general rule, in red-blooded animals furnished with feet and not oviparous, the male is larger and longer-lived than the female (except with the mule, where the female is longer-lived and bigger than the male); whereas in oviparous and vermiparous creatures, as in fishes and in insects, the female is larger than the male; as, for instance, with the serpent, the phalangium or venom-spider, the gecko, and the frog. The same difference in size of the sexes is found in fishes, as, for instance, in the smaller cartilaginous fishes, in the greater part of the gregarious species, and in all that live in and about rocks. The fact that the female is longer-lived than the male is inferred from the fact that female fishes are caught older than males. Furthermore, in all animals the upper and front parts are better, stronger, and more thoroughly equipped in the male than in the female, whereas in the female those parts are the better that may be termed hinder-parts or underparts. And this statement

is applicable to man and to all vivipara that have feet. Again, the female is less muscular and less compactly jointed, and more thin and delicate in the hair – that is, where hair is found; and, where there is no hair, less strongly furnished in some analogous substance. And the female is more flaccid in texture of flesh, and more knock-kneed, and the shin-bones are thinner; and the feet are more arched and hollow in such animals as are furnished with feet. And with regard to voice, the female in all animals that are vocal has a thinner and sharper voice than the male; except, by the way, with kine, for the lowing and bellowing of the cow has a deeper note than that of the bull. With regard to organs of defence and offence, such as teeth, tusks, horns, spurs, and the like, these in some species the male possesses and the female does not; as, for instance, the hind has no horns, and where the cock-bird has a spur the hen is entirely destitute of the organ; and in like manner the sow is devoid of tusks. In other species such organs are found in both sexes, but are more perfectly developed in the male; as, for instance, the horn of the bull is more powerful than the horn of the cow.

Book V

1

As to the parts internal and external that all animals are furnished withal, and further as to the senses, to voice, and

sleep, and the duality sex, all these topics have now been touched upon. It now remains for us to discuss, duly and in order, their several modes of propagation.

These modes are many and diverse, and in some respects are like, and in other respects are unlike to one another. As we carried on our previous discussion genus by genus, so we must attempt to follow the same divisions in our present argument; only that whereas in the former case we started with a consideration of the parts of man, in the present case it behoves us to treat of man last of all because he involves most discussion. We shall commence, then, with testaceans, and then proceed to crustaceans, and then to the other genera in due order; and these other genera are, severally, molluscs, and insects, then fishes viviparous and fishes oviparous, and next birds; and afterwards we shall treat of animals provided with feet, both such as are oviparous and such as are viviparous, and we may observe that some quadrupeds are viviparous, but that the only viviparous biped is man.

Now there is one property that animals are found to have in common with plants. For some plants are generated from the seed of plants, whilst other plants are self-generated through the formation of some elemental principle similar to a seed; and of these latter plants some derive their nutriment from the ground, whilst others grow inside other plants, as is mentioned, by the way, in my treatise on Botany. So with animals, some spring from parent animals according to their kind, whilst others grow spontaneously and not from kindred stock; and of these instances of spontaneous generation some come from putrefying earth or vegetable matter, as is the case with a number of insects, while others are spontaneously generated in the inside of animals out of the secretions of their several organs.

In animals where generation goes by heredity, wherever there is duality of sex generation is due to copulation. In the group of fishes, however, there are some that are neither male nor female, and these, while they are identical generically with other fish, differ from them specifically; but there are others that stand altogether isolated and apart by themselves. Other fishes there are that are always female and never male, and from them are conceived what correspond to the wind-eggs in birds. Such eggs, by the way, in birds are all unfruitful; but it is their nature to be independently capable of generation up to the egg-stage, unless indeed there be some other mode than the one familiar to us of intercourse with the male; but concerning these topics we shall treat more precisely later on. In the case of certain fishes, however, after they have spontaneously generated eggs, these eggs develop into living animals; only that in certain of these cases development is spontaneous, and in others is not independent of the male; and the method of proceeding in regard to these matters will set forth by and by, for the method is somewhat like to the method followed in the case of birds. But whensoever creatures are spontaneously generated, either in other animals, in the soil, or on plants, or in the parts of these, and when such are generated male and female, then from the copulation of such spontaneously generated males and females there is generated a something – a something never identical in shape with the parents, but a something imperfect. For instance, the issue of copulation in lice is nits; in flies, grubs; in fleas, grubs egg-like in shape; and from these issues the parent-species is never reproduced, nor is any animal produced at all, but the like nondescripts only.

First, then, we must proceed to treat of 'covering' in regard to such animals as cover and are covered; and then after this to treat in due order of other matters, both the exceptional and those of general occurrence.

2

Those animals, then, cover and are covered in which there is a duality of sex, and the modes of covering in such animals are not in all cases similar nor analogous. For the red-blooded animals that are viviparous and furnished with feet have in all cases organs adapted for procreation, but the sexes do not in all cases come together in like manner. Thus, opisthuretic animals copulate with a rearward presentment, as is the case with the lion, the hare, and the lynx; though, by the way, in the case of the hare, the female is often observed to cover the male.

The case is similar in most other such animals; that is to say, the majority of quadrupeds copulate as best they can, the male mounting the female; and this is the only method of copulating adopted by birds, though there are certain diversities of method observed even in birds. For in some cases the female squats on the ground and the male mounts on top of her, as is the case with the cock and hen bustard, and the barn-door cock and hen; in other cases, the male mounts without the female squatting, as with the male and female crane; for, with these birds, the male mounts on to the back of the female and covers her, and like the cock-sparrow consumes but very little time in the operation. Of quadrupeds, bears perform the operation lying prone on one another, in the same way as other quadrupeds do while standing up; that is to say, with the belly of the male pressed to the back of the female. Hedgehogs copulate erect, belly to belly.

With regard to large-sized vivipara, the hind only very rarely sustains the mounting of the stag to the full conclusion of the operation, and the same is the case with the cow as regards the

bull, owing to the rigidity of the penis of the bull. In point of fact, the females of these animals elicit the sperm of the male in the act of withdrawing from underneath him; and, by the way, this phenomenon has been observed in the case of the stag and hind, domesticated, of course. Covering with the wolf is the same as with the dog. Cats do not copulate with a rearward presentment on the part of the female, but the male stands erect and the female puts herself underneath him; and, by the way, the female cat is peculiarly lecherous, and wheedles the male on to sexual commerce, and caterwauls during the operation. Camels copulate with the female in a sitting posture, and the male straddles over and covers her, not with the hinder presentment on the female's part but like the other quadrupeds mentioned above, and they pass the whole day long in the operation; when thus engaged they retire to lonely spots, and none but their keeper dare approach them. And, be it observed, the penis of the camel is so sinewy that bow-strings are manufactured out of it. Elephants, also, copulate in lonely places, and especially by river-sides in their usual haunts; the female squats down, and straddles with her legs, and the male mounts and covers her. The seal covers like all opisthuretic animals, and in this species the copulation extends over a lengthened time, as is the case with the dog and bitch; and the penis in the male seal is exceptionally large.

3

Oviparous quadrupeds cover one another in the same way. That is to say, in some cases the male mounts the female precisely as in the viviparous animals, as is observed in both the land and the sea tortoise....And these creatures have an organ in which the ducts converge, and with which they perform the act of

copulation, as is also observed in the toad, the frog, and all other animals of the same group.

4

Long animals devoid of feet, like serpents and muraenae, intertwine in coition, belly to belly. And, in fact, serpents coil round one another so tightly as to present the appearance of a single serpent with a pair of heads. The same mode is followed by the saurians; that is to say, they coil round one another in the act of coition.

5

All fishes, with the exception of the flat selachians, lie down side by side, and copulate belly to belly. Fishes, however, that are flat and furnished with tails – as the ray, the trygon, and the like – copulate not only in this way, but also, where the tail from its thinness is no impediment, by mounting of the male upon the female, belly to back. But the rhina or angel-fish, and other like fishes where the tail is large, copulate only by rubbing against one another sideways, belly to belly. Some men assure us that they have seen some of the selachia copulating hindways, dog and bitch. In the cartilaginous species the female is larger than the male; and the same is the case with other fishes for the most part. And among cartilaginous fishes are included, besides those already named, the bos, the lamia, the aetos, the narce or torpedo, the fishing-frog, and all the galeodes or sharks and dogfish. Cartilaginous fishes, then, of all kinds, have in many

instances been observed copulating in the way above mentioned; for, by the way, in viviparous animals the process of copulation is of longer duration than in the ovipara.

It is the same with the dolphin and with all cetaceans; that is to say, they come side by side, male and female, and copulate, and the act extends over a time which is neither short nor very long.

Again, in cartilaginous fishes the male, in some species, differs from the female in the fact that he is furnished with two appendages hanging down from about the exit of the residuum, and that the female is not so furnished; and this distinction between the sexes is observed in all the species of the sharks and dog-fish.

Now neither fishes nor any animals devoid of feet are furnished with testicles, but male serpents and male fishes have a pair of ducts which fill with milt or sperm at the rutting season, and discharge, in all cases, a milk-like juice. These ducts unite, as in birds; for birds, by the way, have their testicles in their interior, and so have all ovipara that are furnished with feet. And this union of the ducts is so far continued and of such extension as to enter the receptive organ in the female.

In viviparous animals furnished with feet there is outwardly one and the same duct for the sperm and the liquid residuum; but there are separate ducts internally, as has been observed in the differentiation of the organs. And with such animals as are not viviparous the same passage serves for the discharge also of the solid residuum; although, internally, there are two passages, separate but near to one another. And these remarks apply to both male and female; for these animals are unprovided with a bladder except in the case of the tortoise; and the she-tortoise, though furnished with a bladder, has only one passage; and tortoises, by the way, belong to the ovipara.

In the case of oviparous fishes the process of coition is less open to observation. In point of fact, some are led by the want of actual observation to surmise that the female becomes impregnated by swallowing the seminal fluid of the male. And there can be no doubt that this proceeding on the part of the female is often witnessed; for at the rutting season the females follow the males and perform this operation, and strike the males with their mouths under the belly, and the males are thereby induced to part with the sperm sooner and more plentifully. And, further, at the spawning season the males go in pursuit of the females, and, as the female spawns, the males swallow the eggs; and the species is continued in existence by the spawn that survives this process. On the coast of Phoenicia they take advantage of these instinctive propensities of the two sexes to catch both one and the other: that is to say, by using the male of the grey mullet as a decoy they collect and net the female, and by using the female, the male.

The repeated observation of this phenomenon has led to the notion that the process was equivalent to coition, but the fact is that a similar phenomenon is observable in quadrupeds. For at the rutting seasons both the males and the females take to running at their genitals, and the two sexes take to smelling each other at those parts. (With partridges, by the way, if the female gets to leeward of the male, she becomes thereby impregnated. And often when they happen to be in heat she is affected in this wise by the voice of the male, or by his breathing down on her as he flies overhead; and, by the way, both the male and the female partridge keep the mouth wide open and protrude the tongue in the process of coition.)

The actual process of copulation on the part of oviparous fishes is seldom accurately observed, owing to the fact that they very soon fall aside and slip asunder. But, for all that, the process has been observed to take place in the manner above described.

6

Molluscs, such as the octopus, the sepia, and the calamary, have sexual intercourse all in the same way; that is to say, they unite at the mouth, by an interlacing of their tentacles. When, then, the octopus rests its so-called head against the ground and spreads abroad its tentacles, the other sex fits into the outspreading of these tentacles, and the two sexes then bring their suckers into mutual connexion.

Some assert that the male has a kind of penis in one of his tentacles, the one in which are the largest suckers; and they further assert that the organ is tendinous in character, growing attached right up to the middle of the tentacle, and that the latter enables it to enter the nostril or funnel of the female.

Now cuttle-fish and calamaries swim about closely intertwined, with mouths and tentacles facing one another and fitting closely together, and swim thus in opposite directions; and they fit their so-called nostrils into one another, and the one sex swims backwards and the other frontwards during the operation. And the female lays its spawn by the so-called 'blow-hole'; and, by the way, some declare that it is at this organ that the coition really takes place.

7

Crustaceans copulate, as the crawfish, the lobster, the carid and the like, just like the opisthuretic quadrupeds, when the one animal turns up its tail and the other puts his tail on the other's

tail. Copulation takes place in the early spring, near to the shore; and, in fact, the process has often been observed in the case of all these animals. Sometimes it takes place about the time when the figs begin to ripen. Lobsters and carids copulate in like manner.

Crabs copulate at the front parts of one another, belly to belly, throwing their overlapping opercula to meet one another: first the smaller crab mounts the larger at the rear; after he has mounted, the larger one turns on one side. Now, the female differs in no respect from the male except in the circumstance that its operculum is larger, more elevated, and more hairy, and into this operculum it spawns its eggs and in the same neighbourhood is the outlet of the residuum. In the copulative process of these animals there is no protrusion of a member from one animal into the other.

8

Insects copulate at the hinder end, and the smaller individuals mount the larger; and the smaller individual is the male. The female pushes from underneath her sexual organ into the body of the male above, this being the reverse of the operation observed in other creatures; and this organ in the case of some insects appears to be disproportionately large when compared to the size of the body, and that too in very minute creatures; in some insects the disproportion is not so striking. This phenomenon may be witnessed if any one will pull asunder flies that are copulating; and, by the way, these creatures are, under the circumstances, averse to separation; for the intercourse of the sexes in their case is of long duration, as may be observed with common everyday insects, such as the fly and

the cantharis. They all copulate in the manner above described, the fly, the cantharis, the sphondyle, (the phalangium spider) any others of the kind that copulate at all. The phalangia – that is to say, such of the species as spin webs – perform the operation in the following way: the female takes hold of the suspended web at the middle and gives a pull, and the male gives a counter pull; this operation they repeat until they are drawn in together and interlaced at the hinder ends; for, by the way, this mode of copulation suits them in consequence of the rotundity of their stomachs.

So much for the modes of sexual intercourse in all animals; but, with regard to the same phenomenon, there are definite laws followed as regards the season of the year and the age of the animal.

Animals in general seem naturally disposed to this intercourse at about the same period of the year, and that is when winter is changing into summer. And this is the season of spring, in which almost all things that fly or walk or swim take to pairing. Some animals pair and breed in autumn also and in winter, as is the case with certain aquatic animals and certain birds. Man pairs and breeds at all seasons, as is the case also with domesticated animals, owing to the shelter and good feeding they enjoy: that is to say, with those whose period of gestation is also comparatively brief, as the sow and the bitch, and with those birds that breed frequently. Many animals time the season of intercourse with a view to the right nurture subsequently of their young. In the human species, the male is more under sexual excitement in winter, and the female in summer.

With birds the far greater part, as has been said, pair and breed during the spring and early summer, with the exception of the halcyon.

The halcyon breeds at the season of the winter solstice. Accordingly, when this season is marked with calm weather, the name of 'halcyon days' is given to the seven days preceding, and to as many following, the solstice; as Simonides the poet says:

God lulls for fourteen days the winds to sleep

In winter; and this temperate interlude

Men call the Holy Season, when the deep

Cradles the mother Halcyon and her brood.

And these days are calm, when southerly winds prevail at the solstice, northerly ones having been the accompaniment of the Pleiads. The halcyon is said to take seven days for building her nest, and the other seven for laying and hatching her eggs. In our country there are not always halcyon days about the time of the winter solstice, but in the Sicilian seas this season of calm is almost periodical. The bird lays about five eggs.

9

(The aithyia, or diver, and the larus, or gull, lay their eggs on rocks bordering on the sea, two or three at a time; but the gull lays in the summer, and the diver at the beginning of spring, just after the winter solstice, and it broods over its eggs as birds do in general. And neither of these birds resorts to a hiding-place.)

The halcyon is the most rarely seen of all birds. It is seen only about the time of the setting of the Pleiads and the winter solstice. When ships are lying at anchor in the roads, it will hover about a vessel and then disappear in a moment, and

Stesichorus in one of his poems alludes to this peculiarity. The nightingale also breeds at the beginning of summer, and lays five or six eggs; from autumn until spring it retires to a hiding-place.

Insects copulate and breed in winter also, that is when the weather is fine and south winds prevail; such, I mean, as do not hibernate, as the fly and the ant. The greater part of wild animals bring forth once and once only in the year, except in the case of animals like the hare, where the female can become superfoetally impregnated.

In like manner the great majority of fishes breed only once a year, like the shoal-fishes (or, in other words, such as are caught in nets), the tunny, the pelamys, the grey mullet, the chalcis, the mackerel, the sciaena, the psetta and the like, with the exception of the labrax or basse; for this fish (alone amongst those mentioned) breeds twice a year, and the second brood is the weaker of the two. The trichias and the rock-fishes breed twice a year; the red mullet breeds thrice a year, and is exceptional in this respect. This conclusion in regard to the red mullet is inferred from the spawn; for the spawn of the fish may be seen in certain places at three different times of the year. The scorpaena breeds twice a year. The sargue breeds twice, in the spring and in the autumn. The saupe breeds once a year only, in the autumn. The female tunny breeds only once a year, but owing to the fact that the fish in some cases spawn early and in others late, it looks as though the fish bred twice over. The first spawning takes place in December before the solstice, and the latter spawning in the spring. The male tunny differs from the female in being unprovided with the fin beneath the belly which is called aphareus.

10

Of cartilaginous fishes, the rhina or angelfish is the only one that breeds twice; for it breeds at the beginning of autumn, and at the setting of the Pleiads: and, of the two seasons, it is in better condition in the autumn. It engenders at a birth seven or eight young. Certain of the dog-fishes, for example the spotted dog, seem to breed twice a month, and this results from the circumstance that the eggs do not all reach maturity at the same time.

Some fishes breed at all seasons, as the muraena. This animal lays a great number of eggs at a time; and the young when hatched are very small but grow with great rapidity, like the young of the hippurus, for these fishes from being diminutive at the outset grow with exceptional rapidity to an exceptional size. (Be it observed that the muraena breeds at all seasons, but the hippurus only in the spring. The smyrus differs from the smyraena; for the muraena is mottled and weakly, whereas the smyrus is strong and of one uniform colour, and the colour resembles that of the pine-tree, and the animal has teeth inside and out. They say that in this case, as in other similar ones, the one is the male, and the other the female, of a single species. They come out on to the land, and are frequently caught.) Fishes, then, as a general rule, attain their full growth with great rapidity, but this is especially the case, among small fishes, with the coracine or crow-fish: it spawns, by the way, near the shore, in weedy and tangled spots. The orphus also, or sea-perch, is small at first, and rapidly attains a great size. The pelamys and the tunny breed in the Euxine, and nowhere else. The cestreus or mullet, the chrysophrys or gilt-head, and the labrax or basse, breed best where rivers run into the sea. The orcys or large-sized tunny, the scorpis, and many other species spawn in the open sea.

11

Fish for the most part breed some time or other during the three months between the middle of March and the middle of June. Some few breed in autumn: as, for instance, the saupe and the sargus, and such others of this sort as breed shortly before the autumn equinox; likewise the electric ray and the angel-fish. Other fishes breed both in winter and in summer, as was previously observed: as, for instance, in winter-time the basse, the grey mullet, and the belone or pipe-fish; and in summer-time, from the middle of June to the middle of July, the female tunny, about the time of the summer solstice; and the tunny lays a sac-like enclosure in which are contained a number of small eggs. The ryades or shoal-fishes breed in summer.

Of the grey mullets, the chelon begins to be in roe between the middle of November and the middle of December; as also the sargue, and the smyxon or myxon, and the cephalus; and their period of gestation is thirty days. And, by the way, some of the grey mullet species are not produced from copulation, but grow spontaneously from mud and sand.

As a general rule, then, fishes are in roe in the spring-time; while some, as has been said, are so in summer, in autumn, or in winter. But whereas the impregnation in the spring-time follows a general law, impregnation in the other seasons does not follow the same rule either throughout or within the limits of one genus; and, further, conception in these variant seasons is not so prolific. And, indeed, we must bear this in mind, that just as with plants and quadrupeds diversity of locality has much to do not only with general physical health but also with the comparative frequency of sexual intercourse and

generation, so also with regard to fishes locality of itself has much to do not only in regard to the size and vigour of the creature, but also in regard to its parturition and its copulations, causing the same species to breed oftener in one place and seldomer in another.

12

The molluscs also breed in spring. Of the marine molluscs one of the first to breed is the sepia. It spawns at all times of the day and its period of gestation is fifteen days. After the female has laid her eggs, the male comes and discharges the milt over the eggs, and the eggs thereupon harden. And the two sexes of this animal go about in pairs, side by side; and the male is more mottled and more black on the back than the female.

The octopus pairs in winter and breeds in spring, lying hidden for about two months. Its spawn is shaped like a vine-tendril, and resembles the fruit of the white poplar; the creature is extraordinarily prolific, for the number of individuals that come from the spawn is something incalculable. The male differs from the female in the fact that its head is longer, and that the organ called by the fishermen its penis, in the tentacle, is white. The female, after laying her eggs, broods over them, and in consequence gets out of condition, by reason of not going in quest of food during the hatching period.

The purple murex breeds about springtime, and the ceryx at the close of the winter. And, as a general rule, the testaceans are found to be furnished with their so-called eggs in spring-time and in autumn, with the exception of the edible urchin; for this animal has the so-called eggs in most abundance in these seasons, but at no season is unfurnished with them; and it is

furnished with them in especial abundance in warm weather or when a full moon is in the sky. Only, by the way, these remarks do not apply to the sea-urchin found in the Pyrrhaean Straits, for this urchin is at its best for table purposes in the winter; and these urchins are small but full of eggs.

Snails are found by observations to become in all cases impregnated about the same season.

13

(Of birds the wild species, as has been stated, as a general rule pair and breed only once a year. The swallow, however, and the blackbird breed twice. With regard to the blackbird, however, its first brood is killed by inclemency of weather (for it is the earliest of all birds to breed), but the second brood it usually succeeds in rearing.

Birds that are domesticated or that are capable of domestication breed frequently, just as the common pigeon breeds all through the summer, and as is seen in the barn-door hen; for the barn-door cock and hen have intercourse, and the hen breeds, at all seasons alike: excepting by the way, during the days about the winter solstice.

Of the pigeon family there are many diversities; for the peristera or common pigeon is not identical with the peleias or rock-pigeon. In other words, the rock-pigeon is smaller than the common pigeon, and is less easily domesticated; it is also black, and small, red-footed and rough-footed; and in consequence of these peculiarities it is neglected by the pigeon-fancier. The largest of all the pigeon species is the phatta or ring-dove; and the next in size is the oenas or stock-dove; and the stock-dove is

a little larger than the common pigeon. The smallest of all the species is the turtle-dove. Pigeons breed and hatch at all seasons, if they are furnished with a sunny place and all requisites; unless they are so furnished, they breed only in the summer. The spring brood is the best, or the autumn brood. At all events, without doubt, the produce of the hot season, the summer brood, is the poorest of the three.)

14

Further, animals differ from one another in regard to the time of life that is best adapted for sexual intercourse.

To begin with, in most animals the secretion of the seminal fluid and its generative capacity are not phenomena simultaneously manifested, but manifested successively. Thus, in all animals, the earliest secretion of sperm is unfruitful, or if it be fruitful the issue is comparatively poor and small. And this phenomenon is especially observable in man, in viviparous quadrupeds, and in birds; for in the case of man and the quadruped the offspring is smaller, and in the case of the bird, the egg.

For animals that copulate, of one and the same species, the age for maturity is in most species tolerably uniform, unless it occurs prematurely by reason of abnormality, or is postponed by physical injury.

In man, then, maturity is indicated by a change of the tone of voice, by an increase in size and an alteration in appearance of the sexual organs, as also in an increase of size and alteration in appearance of the breasts; and above all, in the hair-growth at the pubes. Man begins to possess seminal fluid about the age of

fourteen, and becomes generatively capable at about the age of twenty-one years.

In other animals there is no hair-growth at the pubes (for some animals have no hair at all, and others have none on the belly, or less on the belly than on the back), but still, in some animals the change of voice is quite obvious; and in some animals other organs give indication of the commencing secretion of the sperm and the onset of generative capacity. As a general rule the female is sharper-toned in voice than the male, and the young animal than the elder; for, by the way, the stag has a much deeper-toned bay than the hind. Moreover, the male cries chiefly at rutting time, and the female under terror and alarm; and the cry of the female is short, and that of the male prolonged. With dogs also, as they grow old, the tone of the bark gets deeper.

There is a difference observable also in the neighings of horses. That is to say, the female foal has a thin small neigh, and the male foal a small neigh, yet bigger and deeper-toned than that of the female, and a louder one as time goes on. And when the young male and female are two years old and take to breeding, the neighing of the stallion becomes loud and deep, and that of the mare louder and shriller than heretofore; and this change goes on until they reach the age of about twenty years; and after this time the neighing in both sexes becomes weaker and weaker.

As a rule, then, as was stated, the voice of the male differs from the voice of the female, in animals where the voice admits of a continuous and prolonged sound, in the fact that the note in the male voice is more deep and bass; not, however, in all animals, for the contrary holds good in the case of some, as for instance in kine: for here the cow has a deeper note than the bull, and the calves a deeper note than the cattle. And we can

thus understand the change of voice in animals that undergo gelding; for male animals that undergo this process assume the characters of the female.

The following are the ages at which various animals become capacitated for sexual commerce. The ewe and the she-goat are sexually mature when one year old, and this statement is made more confidently in respect to the she-goat than to the ewe; the ram and the he-goat are sexually mature at the same age. The progeny of very young individuals among these animals differs from that of other males: for the males improve in the course of the second year, when they become fully mature. The boar and the sow are capable of intercourse when eight months old, and the female brings forth when one year old, the difference corresponding to her period of gestation. The boar is capable of generation when eight months old, but, with a sire under a year in age, the litter is apt to be a poor one. The ages, however, are not invariable; now and then the boar and the sow are capable of intercourse when four months old, and are capable of producing a litter which can be reared when six months old; but at times the boar begins to be capable of intercourse when ten months. He continues sexually mature until he is three years old. The dog and the bitch are, as a rule, sexually capable and sexually receptive when a year old, and sometimes when eight months old; but the priority in date is more common with the dog than with the bitch. The period of gestation with the bitch is sixty days, or sixty-one, or sixty-two, or sixty-three at the utmost; the period is never under sixty days, or, if it is, the litter comes to no good. The bitch, after delivering a litter, submits to the male in six months, but not before. The horse and the mare are, at the earliest, sexually capable and sexually mature when two years old; the issue, however, of parents of this age is small and poor. As a general rule these animals are sexually capable when three years old, and they grow better for breeding purposes until they reach twenty years. The stallion is sexually

capable up to the age of thirty-three years, and the mare up to forty, so that, in point of fact, the animals are sexually capable all their lives long; for the stallion, as a rule, lives for about thirty-five years, and the mare for a little over forty; although, by the way, a horse has known to live to the age of seventy-five. The ass and the she-ass are sexually capable when thirty months old; but, as a rule, they are not generatively mature until they are three years old, or three years and a half. An instance has been known of a she-ass bearing and bringing forth a foal when only a year old. A cow has been known to calve when only a year old, and the calf grew as big as might be expected, but no more. So much for the dates in time at which these animals attain to generative capacity.

In the human species, the male is generative, at the longest, up to seventy years, and the female up to fifty; but such extended periods are rare. As a rule, the male is generative up to the age of sixty-five, and to the age of forty-five the female is capable of conception.

The ewe bears up to eight years, and, if she be carefully tended, up to eleven years; in fact, the ram and the ewe are sexually capable pretty well all their lives long. He-goats, if they be fat, are more or less unserviceable for breeding; and this, by the way, is the reason why country folk say of a vine when it stops bearing that it is 'running the goat'. However, if an over-fat he-goat be thinned down, he becomes sexually capable and generative.

Rams single out the oldest ewes for copulation, and show no regard for the young ones. And, as has been stated, the issue of the younger ewes is poorer than that of the older ones.

The boar is good for breeding purposes until he is three years of age; but after that age his issue deteriorates, for after that age his vigour is on the decline. The boar is most capable after a

good feed, and with the first sow it mounts; if poorly fed or put to many females, the copulation is abbreviated, and the litter is comparatively poor. The first litter of the sow is the fewest in number; at the second litter she is at her prime. The animal, as it grows old, continues to breed, but the sexual desire abates. When they reach fifteen years, they become unproductive, and are getting old. If a sow be highly fed, it is all the more eager for sexual commerce, whether old or young; but, if it be over-fattened in pregnancy, it gives the less milk after parturition. With regard to the age of the parents, the litter is the best when they are in their prime; but with regard to the seasons of the year, the litter is the best that comes at the beginning of winter; and the summer litter the poorest, consisting as it usually does of animals small and thin and flaccid. The boar, if it be well fed, is sexually capable at all hours, night and day; but otherwise is peculiarly salacious early in the morning. As it grows old the sexual passion dies away, as we have already remarked. Very often a boar, when more or less impotent from age or debility, finding itself unable to accomplish the sexual commerce with due speed, and growing fatigued with the standing posture, will roll the sow over on the ground, and the pair will conclude the operation side by side of one another. The sow is sure of conception if it drops its lugs in rutting time; if the ears do not thus drop, it may have to rut a second time before impregnation takes place.

Bitches do not submit to the male throughout their lives, but only until they reach a certain maturity of years. As a general rule, they are sexually receptive and conceptive until they are twelve years old; although, by the way, cases have been known where dogs and bitches have been respectively procreative and conceptive to the ages of eighteen and even of twenty years. But, as a rule, age diminishes the capability of generation and of conception with these animals as with all others.

The female of the camel is opisthuretic, and submits to the male in the way above described; and the season for copulation in Arabia is about the month of October. Its period of gestation is twelve months; and it is never delivered of more than one foal at a time. The female becomes sexually receptive and the male sexually capable at the age of three years. After parturition, an interval of a year elapses before the female is again receptive to the male.

The female elephant becomes sexually receptive when ten years old at the youngest, and when fifteen at the oldest; and the male is sexually capable when five years old, or six. The season for intercourse is spring. The male allows an interval of three years to elapse after commerce with a female: and, after it has once impregnated a female, it has no intercourse with her again. The period of gestation with the female is two years; and only one young animal is produced at a time, in other words it is uniparous. And the embryo is the size of a calf two or three months old.

15

So much for the copulations of such animals as copulate.

We now proceed to treat of generation both with respect to copulating and non-copulating animals, and we shall commence with discussing the subject of generation in the case of the testaceans.

The testacean is almost the only genus that throughout all its species is non-copulative.

The porphyrae, or purple murices, gather together to some one place in the spring-time, and deposit the so-called 'honeycomb'. This substance resembles the comb, only that it is not so neat and delicate; and looks as though a number of husks of white chick-peas were all stuck together. But none of these structures has any open passage, and the porphyra does not grow out of them, but these and all other testaceans grow out of mud and decaying matter. The substance, is, in fact, an excretion of the porphyra and the ceryx; for it is deposited by the ceryx as well. Such, then, of the testaceans as deposit the honeycomb are generated spontaneously like all other testaceans, but they certainly come in greater abundance in places where their congeners have been living previously. At the commencement of the process of depositing the honeycomb, they throw off a slippery mucus, and of this the husklike formations are composed. These formations, then, all melt and deposit their contents on the ground, and at this spot there are found on the ground a number of minute porphyrae, and porphyrae are caught at times with these animalculae upon them, some of which are too small to be differentiated in form. If the porphyrae are caught before producing this honey-comb, they sometimes go through the process in fishing-creels, not here and there in the baskets, but gathering to some one spot all together, just as they do in the sea; and owing to the narrowness of their new quarters they cluster together like a bunch of grapes.

There are many species of the purple murex; and some are large, as those found off Sigeum and Lectum; others are small, as those found in the Euripus, and on the coast of Caria. And those that are found in bays are large and rough; in most of them the peculiar bloom from which their name is derived is dark to blackness, in others it is reddish and small in size; some of the large ones weigh upwards of a mina apiece. But the specimens that are found along the coast and on the rocks are

small-sized, and the bloom in their case is of a reddish hue. Further, as a general rule, in northern waters the bloom is blackish, and in southern waters of a reddish hue. The murex is caught in the spring-time when engaged in the construction of the honeycomb; but it is not caught at any time about the rising of the dog-star, for at that period it does not feed, but conceals itself and burrows. The bloom of the animal is situated between the mecon (or quasi-liver) and the neck, and the co-attachment of these is an intimate one. In colour it looks like a white membrane, and this is what people extract; and if it be removed and squeezed it stains your hand with the colour of the bloom. There is a kind of vein that runs through it, and this quasi-vein would appear to be in itself the bloom. And the qualities, by the way, of this organ are astringent. It is after the murex has constructed the honeycomb that the bloom is at its worst. Small specimens they break in pieces, shells and all, for it is no easy matter to extract the organ; but in dealing with the larger ones they first strip off the shell and then abstract the bloom. For this purpose the neck and mecon are separated, for the bloom lies in between them, above the so-called stomach; hence the necessity of separating them in abstracting the bloom. Fishermen are anxious always to break the animal in pieces while it is yet alive, for, if it die before the process is completed, it vomits out the bloom; and for this reason the fishermen keep the animals in creels, until they have collected a sufficient number and can attend to them at their leisure. Fishermen in past times used not to lower creels or attach them to the bait, so that very often the animal got dropped off in the pulling up; at present, however, they always attach a basket, so that if the animal fall off it is not lost. The animal is more inclined to slip off the bait if it be full inside; if it be empty it is difficult to shake it off. Such are the phenomena connected with the porphyra or murex.

The same phenomena are manifested by the ceryx or trumpet-shell; and the seasons are the same in which the phenomena are observable. Both animals, also, the murex and the ceryx, have their opercula similarly situated – and, in fact, all the stromboids, and this is congenital with them all; and they feed by protruding the so-called tongue underneath the operculum. The tongue of the murex is bigger than one's finger, and by means of it, it feeds, and perforates conchylia and the shells of its own kind. Both the murex and the ceryx are long lived. The murex lives for about six years; and the yearly increase is indicated by a distinct interval in the spiral convolution of the shell.

The mussel also constructs a honeycomb.

With regard to the limnostreae, or lagoon oysters, wherever you have slimy mud there you are sure to find them beginning to grow. Cockles and clams and razor-fishes and scallops row spontaneously in sandy places. The pinna grows straight up from its tuft of anchoring fibres in sandy and slimy places; these creatures have inside them a parasite nicknamed the pinna-guard, in some cases a small carid and in other cases a little crab; if the pinna be deprived of this pinna-guard it soon dies.

As a general rule, then, all testaceans grow by spontaneous generation in mud, differing from one another according to the differences of the material; oysters growing in slime, and cockles and the other testaceans above mentioned on sandy bottoms; and in the hollows of the rocks the ascidian and the barnacle, and common sorts, such as the limpet and the nerites. All these animals grow with great rapidity, especially the murex and the scallop; for the murex and the scallop attain their full growth in a year. In some of the testaceans white crabs are found, very diminutive in size; they are most numerous in the

trough shaped mussel. In the pinna also is found the so-called pinna-guard. They are found also in the scallop and in the oyster; these parasites never appear to grow in size. Fishermen declare that the parasite is congenital with the larger animal. (Scallops burrow for a time in the sand, like the murex.)

(Shell-fish, then, grow in the way above mentioned; and some of them grow in shallow water, some on the sea-shore, some in rocky places, some on hard and stony ground, and some in sandy places.) Some shift about from place to place, others remain permanent on one spot. Of those that keep to one spot the pinnae are rooted to the ground; the razor-fish and the clam keep to the same locality, but are not so rooted; but still, if forcibly removed they die.

(The star-fish is naturally so warm that whatever it lays hold of is found, when suddenly taken away from the animal, to have undergone a process like boiling. Fishermen say that the star-fish is a great pest in the Strait of Pyrrha. In shape it resembles a star as seen in an ordinary drawing. The so-called 'lungs' are generated spontaneously. The shells that painters use are a good deal thicker, and the bloom is outside the shell on the surface. These creatures are mostly found on the coast of Caria.)

The hermit-crab grows spontaneously out of soil and slime, and finds its way into untenanted shells. As it grows it shifts to a larger shell, as for instance into the shell of the nerites, or of the strombus or the like, and very often into the shell of the small ceryx. After entering new shell, it carries it about, and begins again to feed, and, by and by, as it grows, it shifts again into another larger one.

16

Moreover, the animals that are unfurnished with shells grow spontaneously, like the testaceans, as, for instance, the sea-nettles and the sponges in rocky caves.

Of the sea-nettle, or sea-anemone, there are two species; and of these one species lives in hollows and never loosens its hold upon the rocks, and the other lives on smooth flat reefs, free and detached, and shifts its position from time to time. (Limpets also detach themselves, and shift from place to place.)

In the chambered cavities of sponges pinna-guards or parasites are found. And over the chambers there is a kind of spider's web, by the opening and closing of which they catch mute fishes; that is to say, they open the web to let the fish get in, and close it again to entrap them.

Of sponges there are three species; the first is of loose porous texture, the second is close textured, the third, which is nicknamed 'the sponge of Achilles', is exceptionally fine and close-textured and strong. This sponge is used as a lining to helmets and greaves, for the purpose of deadening the sound of the blow; and this is a very scarce species. Of the close textured sponges such as are particularly hard and rough are nicknamed 'goats'.

Sponges grow spontaneously either attached to a rock or on sea-beaches, and they get their nutriment in slime: a proof of this statement is the fact that when they are first secured they are found to be full of slime. This is characteristic of all living creatures that get their nutriment by close local attachment. And, by the way, the close-textured sponges are weaker than the more openly porous ones because their attachment extends over a smaller area.

It is said that the sponge is sensitive; and as a proof of this statement they say that if the sponge is made aware of an attempt being made to pluck it from its place of attachment it draws itself together, and it becomes a difficult task to detach it. It makes a similar contractile movement in windy and boisterous weather, obviously with the object of tightening its hold. Some persons express doubts as to the truth of this assertion; as, for instance, the people of Torone.

The sponge breeds parasites, worms, and other creatures, on which, if they be detached, the rock-fishes prey, as they prey also on the remaining stumps of the sponge; but, if the sponge be broken off, it grows again from the remaining stump and the place is soon as well covered as before.

The largest of all sponges are the loose-textured ones, and these are peculiarly abundant on the coast of Lycia. The softest are the close-textured sponges; for, by the way, the so-called sponges of Achilles are harder than these. As a general rule, sponges that are found in deep calm waters are the softest; for usually windy and stormy weather has a tendency to harden them (as it has to harden all similar growing things), and to arrest their growth. And this accounts for the fact that the sponges found in the Hellespont are rough and close-textured; and, as a general rule, sponges found beyond or inside Cape Malea are, respectively, comparatively soft or comparatively hard. But, by the way, the habitat of the sponge should not be too sheltered and warm, for it has a tendency to decay, like all similar vegetable-like growths. And this accounts for the fact that the sponge is at its best when found in deep water close to shore; for owing to the depth of the water they enjoy shelter alike from stormy winds and from excessive heat.

Whilst they are still alive and before they are washed and cleaned, they are blackish in colour. Their attachment is not

made at one particular spot, nor is it made all over their bodies; for vacant pore-spaces intervene. There is a kind of membrane stretched over the under parts; and in the under parts the points of attachment are the more numerous. On the top most of the pores are closed, but four or five are open and visible; and we are told by some that it is through these pores that the animal takes its food.

There is a particular species that is named the 'aplysia' or the 'unwashable', from the circumstance that it cannot be cleaned. This species has the large open and visible pores, but all the rest of the body is close-textured; and, if it be dissected, it is found to be closer and more glutinous than the ordinary sponge, and, in a word, something lung like in consistency. And, on all hands, it is allowed that this species is sensitive and long-lived. They are distinguished in the sea from ordinary sponges from the circumstance that the ordinary sponges are white while the slime is in them, but that these sponges are under any circumstances black.

And so much with regard to sponges and to generation in the testaceans.

17

Of crustaceans, the female crawfish after copulation conceives and retains its eggs for about three months, from about the middle of May to about the middle of August; they then lay the eggs into the folds underneath the belly, and their eggs grow like grubs. This same phenomenon is observable in molluscs also, and in such fishes as are oviparous; for in all these cases the egg continues to grow.

The spawn of the crawfish is of a loose or granular consistency, and is divided into eight parts; for corresponding to each of the flaps on the side there is a gristly formation to which the spawn is attached, and the entire structure resembles a cluster of grapes; for each gristly formation is split into several parts. This is obvious enough if you draw the parts asunder; but at first sight the whole appears to be one and indivisible. And the largest are not those nearest to the outlet but those in the middle, and the farthest off are the smallest. The size of the small eggs is that of a small seed in a fig; and they are not quite close to the outlet, but placed middleways; for at both ends, tailwards and trunkwards, there are two intervals devoid of eggs; for it is thus that the flaps also grow. The side flaps, then, cannot close, but by placing the end flap on them the animal can close up all, and this end-flap serves them for a lid. And in the act of laying its eggs it seems to bring them towards the gristly formations by curving the flap of its tail, and then, squeezing the eggs towards the said gristly formations and maintaining a bent posture, it performs the act of laying. The gristly formations at these seasons increase in size and become receptive of the eggs; for the animal lays its eggs into these formations, just as the sepia lays its eggs among twigs and driftwood.

It lays its eggs, then, in this manner, and after hatching them for about twenty days it rids itself of them all in one solid lump, as is quite plain from outside. And out of these eggs crawfish form in about fifteen days, and these crawfish are caught at times less then a finger's breadth, or seven-tenths of an inch, in length. The animal, then, lays its eggs before the middle of September, and after the middle of that month throws off its eggs in a lump. With the humped carids or prawns the time for gestation is four months or thereabouts.

Crawfish are found in rough and rocky places, lobsters in smooth places, and neither crawfish nor lobsters are found in muddy ones; and this accounts for the fact that lobsters are found in the Hellespont and on the coast of Thasos, and crawfish in the neighbourhood of Sigeum and Mount Athos. Fishermen, accordingly, when they want to catch these various creatures out at sea, take bearings on the beach and elsewhere that tell them where the ground at the bottom is stony and where soft with slime. In winter and spring these animals keep in near to land, in summer they keep in deep water; thus at various times seeking respectively for warmth or coolness.

The so-called arctus or bear-crab lays its eggs at about the same time as the crawfish; and consequently in winter and in the spring-time, before laying their eggs, they are at their best, and after laying at their worst.

They cast their shell in the spring-time (just as serpents shed their so-called 'old-age' or slough), both directly after birth and in later life; this is true both of crabs and crawfish. And, by the way, all crawfish are long lived.

18

Molluscs, after pairing and copulation, lay a white spawn; and this spawn, as in the case of the testacean, gets granular in time. The octopus discharges into its hole, or into a potsherd or into any similar cavity, a structure resembling the tendrils of a young vine or the fruit of the white poplar, as has been previously observed. The eggs, when the female has laid them, are clustered round the sides of the hole. They are so numerous that, if they be removed they suffice to fill a vessel much larger than the animal's body in which they were contained. Some

fifty days later, the eggs burst and the little polypuses creep out, like little spiders, in great numbers; the characteristic form of their limbs is not yet to be discerned in detail, but their general outline is clear enough. And, by the way, they are so small and helpless that the greater number perish; it is a fact that they have been seen so extremely minute as to be absolutely without organization, but nevertheless when touched they moved. The eggs of the sepia look like big black myrtle-berries, and they are linked all together like a bunch of grapes, clustered round a centre, and are not easily sundered from one another: for the male exudes over them some moist glairy stuff, which constitutes the sticky gum. These eggs increase in size; and they are white at the outset, but black and larger after the sprinkling of the male seminal fluid.

When it has come into being the young sepia is first distinctly formed inside out of the white substance, and when the egg bursts it comes out. The inner part is formed as soon as the female lays the egg, something like a hail-stone; and out of this substance the young sepia grows by a head-attachment, just as young birds grow by a belly-attachment. What is the exact nature of the navel-attachment has not yet been observed, except that as the young sepia grows the white substance grows less and less in size, and at length, as happens with the yolk in the case of birds, the white substance in the case of the young sepia disappears. In the case of the young sepia, as in the case of the young of most animals, the eyes at first seem very large. To illustrate this by way of a figure, let A represent the ovum, B and C the eyes, and D the sepidium, or body of the little sepia. (See diagram.)

The female sepia goes pregnant in the spring-time, and lays its eggs after fifteen days of gestation; after the eggs are laid there comes in another fifteen days something like a bunch of grapes, and at the bursting of these the young sepiae issue forth. But if,

when the young ones are fully formed, you sever the outer covering a moment too soon, the young creatures eject excrement, and their colour changes from white to red in their alarm.

Crustaceans, then, hatch their eggs by brooding over them as they carry them about beneath their bodies; but the octopus, the sepia, and the like hatch their eggs without stirring from the spot where they may have laid them, and this statement is particularly applicable to the sepia; in fact, the nest of the female sepia is often seen exposed to view close in to shore. The female octopus at times sits brooding over her eggs, and at other times squats in front of her hole, stretching out her tentacles on guard.

The sepia lays her spawn near to land in the neighbourhood of sea-weed or reeds or any off-sweepings such as brushwood, twigs, or stones; and fishermen place heaps of faggots here and there on purpose, and on to such heaps the female deposits a long continuous roe in shape like a vine tendril. It lays or spirts out the spawn with an effort, as though there were difficulty in the process. The female calamary spawns at sea; and it emits the spawn, as does the sepia, in the mass.

The calamary and the cuttle-fish are short-lived, as, with few exceptions, they never see the year out; and the same statement is applicable to the octopus.

From one single egg comes one single sepia; and this is likewise true of the young calamary.

The male calamary differs from the female; for if its gill-region be dilated and examined there are found two red formations resembling breasts, with which the male is unprovided. In the sepia, apart from this distinction in the sexes, the male, as has been stated, is more mottled than the female.

19

With regard to insects, that the male is less than the female and that he mounts upon her back, and how he performs the act of copulation and the circumstance that he gives over reluctantly, all this has already been set forth, most cases of insect copulation this process is speedily followed up by parturition.

All insects engender grubs, with the exception of a species of butterfly; and the female of this species lays a hard egg, resembling the seed of the cnecus, with a juice inside it. But from the grub, the young animal does not grow out of a mere portion of it, as a young animal grows from a portion only of an egg, but the grub entire grows and the animal becomes differentiated out of it.

And of insects some are derived from insect congeners, as the venom-spider and the common-spider from the venom-spider and the common-spider, and so with the attelabus or locust, the acris or grasshopper, and the tettix or cicada. Other insects are not derived from living parentage, but are generated spontaneously: some out of dew falling on leaves, ordinarily in spring-time, but not seldom in winter when there has been a stretch of fair weather and southerly winds; others grow in decaying mud or dung; others in timber, green or dry; some in the hair of animals; some in the flesh of animals; some in excrements: and some from excrement after it has been voided, and some from excrement yet within the living animal, like the helminthes or intestinal worms. And of these intestinal worms there are three species: one named the flat-worm, another the round worm, and the third the ascarid. These intestinal worms do not in any case propagate their kind. The flat-worm,

however, in an exceptional way, clings fast to the gut, and lays a thing like a melon-seed, by observing which indication the physician concludes that his patient is troubled with the worm.

The so-called psyche or butterfly is generated from caterpillars which grow on green leaves, chiefly leaves of the raphanus, which some call crambe or cabbage. At first it is less than a grain of millet; it then grows into a small grub; and in three days it is a tiny caterpillar. After this it grows on and on, and becomes quiescent and changes its shape, and is now called a chrysalis. The outer shell is hard, and the chrysalis moves if you touch it. It attaches itself by cobweb-like filaments, and is unfurnished with mouth or any other apparent organ. After a little while the outer covering bursts asunder, and out flies the winged creature that we call the psyche or butterfly. At first, when it is a caterpillar, it feeds and ejects excrement; but when it turns into the chrysalis it neither feeds nor ejects excrement.

The same remarks are applicable to all such insects as are developed out of the grub, both such grubs as are derived from the copulation of living animals and such as are generated without copulation on the part of parents. For the grub of the bee, the anthrena, and the wasp, whilst it is young, takes food and voids excrement; but when it has passed from the grub shape to its defined form and become what is termed a 'nympha', it ceases to take food and to void excrement, and remains tightly wrapped up and motionless until it has reached its full size, when it breaks the formation with which the cell is closed, and issues forth. The insects named the hypera and the penia are derived from similar caterpillars, which move in an undulatory way, progressing with one part and then pulling up the hinder parts by a bend of the body. The developed insect in each case takes its peculiar colour from the parent caterpillar.

From one particular large grub, which has as it were horns, and in other respects differs from grubs in general, there comes, by a metamorphosis of the grub, first a caterpillar, then the cocoon, then the necydalus; and the creature passes through all these transformations within six months. A class of women unwind and reel off the cocoons of these creatures, and afterwards weave a fabric with the threads thus unwound; a Coan woman of the name of Pamphila, daughter of Plateus, being credited with the first invention of the fabric. After the same fashion the carabus or stag-beetle comes from grubs that live in dry wood: at first the grub is motionless, but after a while the shell bursts and the stag-beetle issues forth.

From the cabbage is engendered the cabbageworm, and from the leek the prasocuris or leekbane; this creature is also winged. From the flat animalcule that skims over the surface of rivers comes the oestrus or gadfly; and this accounts for the fact that gadflies most abound in the neighbourhood of waters on whose surface these animalcules are observed. From a certain small, black and hairy caterpillar comes first a wingless glow-worm; and this creature again suffers a metamorphosis, and transforms into a winged insect named the bostrychus (or hair-curl).

Gnats grow from ascarids; and ascarids are engendered in the slime of wells, or in places where there is a deposit left by the draining off of water. This slime decays, and first turns white, then black, and finally blood-red; and at this stage there originate in it, as it were, little tiny bits of red weed, which at first wriggle about all clinging together, and finally break loose and swim in the water, and are hereupon known as ascarids. After a few days they stand straight up on the water motionless and hard, and by and by the husk breaks off and the gnats are seen sitting upon it, until the sun's heat or a puff of wind sets them in motion, when they fly away.

With all grubs and all animals that break out from the grub state, generation is due primarily to the heat of the sun or to wind.

Ascarids are more likely to be found, and grow with unusual rapidity, in places where there is a deposit of a mixed and heterogeneous kind, as in kitchens and in ploughed fields, for the contents of such places are disposed to rapid putrefaction. In autumn, also, owing to the drying up of moisture, they grow in unusual numbers.

The tick is generated from couch-grass. The cockchafer comes from a grub that is generated in the dung of the cow or the ass. The cantharus or scarabeus rolls a piece of dung into a ball, lies hidden within it during the winter, and gives birth therein to small grubs, from which grubs come new canthari. Certain winged insects also come from the grubs that are found in pulse, in the same fashion as in the cases described.

Flies grow from grubs in the dung that farmers have gathered up into heaps: for those who are engaged in this work assiduously gather up the compost, and this they technically term 'working-up' the manure. The grub is exceedingly minute to begin with; first even at this stage – it assumes a reddish colour, and then from a quiescent state it takes on the power of motion, as though born to it; it then becomes a small motionless grub; it then moves again, and again relapses into immobility; it then comes out a perfect fly, and moves away under the influence of the sun's heat or of a puff of air. The myops or horse-fly is engendered in timber. The orsodacna or budbane is a transformed grub; and this grub is engendered in cabbage-stalks. The cantharis comes from the caterpillars that are found on fig-trees or pear-trees or fir-trees – for on all these grubs are engendered – and also from caterpillars found on the dog-rose; and the cantharis takes eagerly to ill-scented

substances, from the fact of its having been engendered in ill-scented woods. The conops comes from a grub that is engendered in the slime of vinegar.

And, by the way, living animals are found in substances that are usually supposed to be incapable of putrefaction; for instance, worms are found in long-lying snow; and snow of this description gets reddish in colour, and the grub that is engendered in it is red, as might have been expected, and it is also hairy. The grubs found in the snows of Media are large and white; and all such grubs are little disposed to motion. In Cyprus, in places where copper-ore is smelted, with heaps of the ore piled on day after day, an animal is engendered in the fire, somewhat larger than a blue bottle fly, furnished with wings, which can hop or crawl through the fire. And the grubs and these latter animals perish when you keep the one away from the fire and the other from the snow. Now the salamander is a clear case in point, to show us that animals do actually exist that fire cannot destroy; for this creature, so the story goes, not only walks through the fire but puts it out in doing so.

On the river Hypanis in the Cimmerian Bosphorus, about the time of the summer solstice, there are brought down towards the sea by the stream what look like little sacks rather bigger than grapes, out of which at their bursting issues a winged quadruped. The insect lives and flies about until the evening, but as the sun goes down it pines away, and dies at sunset having lived just one day, from which circumstance it is called the ephemeron.

As a rule, insects that come from caterpillars and grubs are held at first by filaments resembling the threads of a spider's web.

Such is the mode of generation of the insects above enumerated. but if the latter impregnation takes placeduring the change of the yellow

20

The wasps that are nicknamed ‘the ichneumons’ (or hunters), less in size, by the way, than the ordinary wasp, kill spiders and carry off the dead bodies to a wall or some such place with a hole in it; this hole they smear over with mud and lay their grubs inside it, and from the grubs come the hunter-wasps. Some of the coleoptera and of the small and nameless insects make small holes or cells of mud on a wall or on a grave-stone, and there deposit their grubs.

With insects, as a general rule, the time of generation from its commencement to its completion comprises three or four weeks. With grubs and grub-like creatures the time is usually three weeks, and in the oviparous insects as a rule four. But, in the case of oviparous insects, the egg-formation comes at the close of seven days from copulation, and during the remaining three weeks the parent broods over and hatches its young; i.e. where this is the result of copulation, as in the case of the spider and its congeners. As a rule, the transformations take place in intervals of three or four days, corresponding to the lengths of interval at which the crises recur in intermittent fevers.

So much for the generation of insects. Their death is due to the shrivelling of their organs, just as the larger animals die of old age.

Winged insects die in autumn from the shrinking of their wings. The myops dies from dropsy in the eyes.

21

With regard to the generation of bees different hypotheses are in vogue. Some affirm that bees neither copulate nor give birth to young, but that they fetch their young. And some say that they fetch their young from the flower of the callyntrum; others assert that they bring them from the flower of the reed, others, from the flower of the olive. And in respect to the olive theory, it is stated as a proof that, when the olive harvest is most abundant, the swarms are most numerous. Others declare that they fetch the brood of the drones from such things as above mentioned, but that the working bees are engendered by the rulers of the hive.

Now of these rulers there are two kinds: the better kind is red in colour, the inferior kind is black and variegated; the ruler is double the size of the working bee. These rulers have the abdomen or part below the waist half as large again, and they are called by some the 'mothers', from an idea that they bear or generate the bees; and, as a proof of this theory of their motherhood, they declare that the brood of the drones appears even when there is no ruler-bee in the hive, but that the bees do not appear in his absence. Others, again, assert that these insects copulate, and that the drones are male and the bees female.

The ordinary bee is generated in the cells of the comb, but the ruler-bees in cells down below attached to the comb, suspended from it, apart from the rest, six or seven in number, and growing in a way quite different from the mode of growth of the ordinary brood.

Bees are provided with a sting, but the drones are not so provided. The rulers are provided with stings, but they never use

them; and this latter circumstance will account for the belief of some people that they have no stings at all.

22

Of bees there are various species. The best kind is a little round mottled insect; another is long, and resembles the anthrena; a third is a black and flat-bellied, and is nick-named the 'robber'; a fourth kind is the drone, the largest of all, but stingless and inactive. And this proportionate size of the drone explains why some bee-masters place a net-work in front of the hives; for the network is put to keep the big drones out while it lets the little bees go in.

Of the king bees there are, as has been stated, two kinds. In every hive there are more kings than one; and a hive goes to ruin if there be too few kings, not because of anarchy thereby ensuing, but, as we are told, because these creatures contribute in some way to the generation of the common bees. A hive will go also to ruin if there be too large a number of kings in it; for the members of the hives are thereby subdivided into too many separate factions.

Whenever the spring-time is late a-coming, and when there is drought and mildew, then the progeny of the hive is small in number. But when the weather is dry they attend to the honey, and in rainy weather their attention is concentrated on the brood; and this will account for the coincidence of rich olive-harvests and abundant swarms.

The bees first work at the honeycomb, and then put the pupae in it: by the mouth, say those who hold the theory of their bringing them from elsewhere. After putting in the pupae they

put in the honey for subsistence, and this they do in the summer and autumn; and, by the way, the autumn honey is the better of the two.

The honeycomb is made from flowers, and the materials for the wax they gather from the resinous gum of trees, while honey is distilled from dew, and is deposited chiefly at the risings of the constellations or when a rainbow is in the sky: and as a general rule there is no honey before the rising of the Pleiads. (The bee, then, makes the wax from flowers. The honey, however, it does not make, but merely gathers what is deposited out of the atmosphere; and as a proof of this statement we have the known fact that occasionally bee-keepers find the hives filled with honey within the space of two or three days. Furthermore, in autumn flowers are found, but honey, if it be withdrawn, is not replaced; now, after the withdrawal of the original honey, when no food or very little is in the hives, there would be a fresh stock of honey, if the bees made it from flowers.) Honey, if allowed to ripen and mature, gathers consistency; for at first it is like water and remains liquid for several days. If it be drawn off during these days it has no consistency; but it attains consistency in about twenty days. The taste of thyme-honey is discernible at once, from its peculiar sweetness and consistency.

The bee gathers from every flower that is furnished with a calyx or cup, and from all other flowers that are sweet-tasted, without doing injury to any fruit; and the juices of the flowers it takes up with the organ that resembles a tongue and carries off to the hive.

Swarms are robbed of their honey on the appearance of the wild fig. They produce the best larvae at the time the honey is a-making. The bee carries wax and bees' bread round its legs, but vomits the honey into the cell. After depositing its young, it broods over it like a bird. The grub when it is small lies

slantwise in the comb, but by and by rises up straight by an effort of its own and takes food, and holds on so tightly to the honeycomb as actually to cling to it.

The young of bees and of drones is white, and from the young come the grubs; and the grubs grow into bees and drones. The egg of the king bee is reddish in colour, and its substance is about as consistent as thick honey; and from the first it is about as big as the bee that is produced from it. From the young of the king bee there is no intermediate stage, it is said, of the grub, but the bee comes at once.

Whenever the bee lays an egg in the comb there is always a drop of honey set against it. The larva of the bee gets feet and wings as soon as the cell has been stopped up with wax, and when it arrives at its completed form it breaks its membrane and flies away. It ejects excrement in the grub state, but not afterwards; that is, not until it has got out of the encasing membrane, as we have already described. If you remove the heads from off the larvae before the coming of the wings, the bees will eat them up; and if you nip off the wings from a drone and let it go, the bees will spontaneously bite off the wings from off all the remaining drones.

The bee lives for six years as a rule, as an exception for seven years. If a swarm lasts for nine years, or ten, great credit is considered due to its management.

In Pontus are found bees exceedingly white in colour, and these bees produce their honey twice a month. (The bees in Themiscyra, on the banks of the river Thermodon, build honeycombs in the ground and in hives, and these honeycombs are furnished with very little wax but with honey of great consistency; and the honeycomb, by the way, is smooth and level.) But this is not always the case with these bees, but only in the winter season; for in Pontus the ivy is abundant, and it

flowers at this time of the year, and it is from the ivy-flower that they derive their honey. A white and very consistent honey is brought down from the upper country to Amisus, which is deposited by bees on trees without the employment of honeycombs: and this kind of honey is produced in other districts in Pontus.

There are bees also that construct triple honeycombs in the ground; and these honeycombs supply honey but never contain grubs. But the honeycombs in these places are not all of this sort, nor do all the bees construct them.

23

Anthrenae and wasps construct combs for their young. When they have no king, but are wandering about in search of one, the anthrene constructs its comb on some high place, and the wasp inside a hole. When the anthrene and the wasp have a king, they construct their combs underground. Their combs are in all cases hexagonal like the comb of the bee. They are composed, however, not of wax, but of a bark-like filamented fibre, and the comb of the anthrene is much neater than the comb of the wasp. Like the bee, they put their young just like a drop of liquid on to the side of the cell, and the egg clings to the wall of the cell. But the eggs are not deposited in the cells simultaneously; on the contrary, in some cells are creatures big enough to fly, in others are nymphae, and in others are mere grubs. As in the case of bees, excrement is observed only in the cells where the grubs are found. As long as the creatures are in the nymph condition they are motionless, and the cell is cemented over. In the comb of the anthrene there is found in the cell of the young a drop of honey in front of it. The larvae of the anthrene and the

wasp make their appearance not in the spring but in the autumn; and their growth is especially discernible in times of full moon. And, by the way, the eggs and the grubs never rest at the bottom of the cells, but always cling on to the side wall.

24

There is a kind of humble-bee that builds a cone-shaped nest of clay against a stone or in some similar situation, besmearing the clay with something like spittle. And this nest or hive is exceedingly thick and hard; in point of fact, one can hardly break it open with a spike. Here the insects lay their eggs, and white grubs are produced wrapped in a black membrane. Apart from the membrane there is found some wax in the honeycomb; and this a wax is much sallower in hue than the wax in the honeycomb of the bee.

25

Ants copulate and engender grubs; and these grubs attach themselves to nothing in particular, but grow on and on from small and rounded shapes until they become elongated and defined in shape: and they are engendered in spring-time.

26

The land-scorpion also lays a number of egg shaped grubs, and broods over them. When the hatching is completed, the parent animal, as happens with the parent spider, is ejected and put to death by the young ones; for very often the young ones are about eleven in number.

27

Spiders in all cases copulate in the way above mentioned, and generate at first small grubs. And these grubs metamorphose in their entirety, and not partially, into spiders; for, by the way, the grubs are round-shaped at the outset. And the spider, when it lays its eggs, broods over them, and in three days the eggs or grubs take definite shape.

All spiders lay their eggs in a web; but some spiders lay in a small and fine web, and others in a thick one; and some, as a rule, lay in a round-shaped case or capsule, and some are only partially enveloped in the web. The young grubs are not all developed at one and the same time into young spiders; but the moment the development takes place, the young spider makes a leap and begins to spin his web. The juice of the grub, if you squeeze it, is the same as the juice found in the spider when young; that is to say, it is thick and white.

The meadow spider lays its eggs into a web, one half of which is attached to itself and the other half is free; and on this the parent broods until the eggs are hatched. The phalangia lay their eggs in a sort of strong basket which they have woven, and brood over it until the eggs are hatched. The smooth spider is much less prolific than the phalangium or hairy spider. These

phalangia, when they grow to full size, very often envelop the mother phalangium and eject and kill her; and not seldom they kill the father-phalangium as well, if they catch him: for, by the way, he has the habit of co-operating with the mother in the hatching. The brood of a single phalangium is sometimes three hundred in number. The spider attains its full growth in about four weeks.

28

Grasshoppers (or locusts) copulate in the same way as other insects; that is to say, with the lesser covering the larger, for the male is smaller than the female. The females first insert the hollow tube, which they have at their tails, in the ground, and then lay their eggs: and the male, by the way, is not furnished with this tube. The females lay their eggs all in a lump together, and in one spot, so that the entire lump of eggs resembles a honeycomb. After they have laid their eggs, the eggs assume the shape of oval grubs that are enveloped by a sort of thin clay, like a membrane; in this membrane-like formation they grow on to maturity. The larva is so soft that it collapses at a touch. The larva is not placed on the surface of the ground, but a little beneath the surface; and, when it reaches maturity, it comes out of its clayey investiture in the shape of a little black grasshopper; by and by, the skin integument strips off, and it grows larger and larger.

The grasshopper lays its eggs at the close of summer, and dies after laying them. The fact is that, at the time of laying the eggs, grubs are engendered in the region of the mother grasshopper's neck; and the male grasshoppers die about the same time. In spring-time they come out of the ground; and, by the way, no

grasshoppers are found in mountainous land or in poor land, but only in flat and loamy land, for the fact is they lay their eggs in cracks of the soil. During the winter their eggs remain in the ground; and with the coming of summer the last year's larva develops into the perfect grasshopper.

29

The attelabi or locusts lay their eggs and die in like manner after laying them. Their eggs are subject to destruction by the autumn rains, when the rains are unusually heavy; but in seasons of drought the locusts are exceedingly numerous, from the absence of any destructive cause, since their destruction seems then to be a matter of accident and to depend on luck.

30

Of the cicada there are two kinds; one, small in size, the first to come and the last to disappear; the other, large, the singing one that comes last and first disappears. Both in the small and the large species some are divided at the waist, to wit, the singing ones, and some are undivided; and these latter have no song. The large and singing cicada is by some designated the 'chirper', and the small cicada the 'tettigonium' or cicadelle. And, by the way, such of the tettigonia as are divided at the waist can sing just a little.

The cicada is not found where there are no trees; and this accounts for the fact that in the district surrounding the city of Cyrene it is not found at all in the plain country, but is found in

great numbers in the neighbourhood of the city, and especially where olive-trees are growing: for an olive grove is not thickly shaded. And the cicada is not found in cold places, and consequently is not found in any grove that keeps out the sunlight.

The large and the small cicada copulate alike, belly to belly. The male discharges sperm into the female, as is the case with insects in general, and the female cicada has a cleft generative organ; and it is the female into which the male discharges the sperm.

They lay their eggs in fallow lands, boring a hole with the pointed organ they carry in the rear, as do the locusts likewise; for the locust lays its eggs in untilled lands, and this fact may account for their numbers in the territory adjacent to the city of Cyrene. The cicadae also lay their eggs in the canes on which husbandmen prop vines, perforating the canes; and also in the stalks of the squill. This brood runs into the ground. And they are most numerous in rainy weather. The grub, on attaining full size in the ground, becomes a tettigometra (or nymph), and the creature is sweetest to the taste at this stage before the husk is broken. When the summer solstice comes, the creature issues from the husk at night-time, and in a moment, as the husk breaks, the larva becomes the perfect cicada. creature, also, at once turns black in colour and harder and larger, and takes to singing. In both species, the larger and the smaller, it is the male that sings, and the female that is unvocal. At first, the males are the sweeter eating; but, after copulation, the females, as they are full then of white eggs.

If you make a sudden noise as they are flying overhead they let drop something like water. Country people, in regard to this, say that they are voiding urine, ie. that they have an excrement, and that they feed upon dew.

If you present your finger to a cicada and bend back the tip of it and then extend it again, it will endure the presentation more quietly than if you were to keep your finger outstretched altogether; and it will set to climbing your finger: for the creature is so weak-sighted that it will take to climbing your finger as though that were a moving leaf.

31

Of insects that are not carnivorous but that live on the juices of living flesh, such as lice and fleas and bugs, all, without exception, generate what are called 'nits', and these nits generate nothing.

Of these insects the flea is generated out of the slightest amount of putrefying matter; for wherever there is any dry excrement, a flea is sure to be found. Bugs are generated from the moisture of living animals, as it dries up outside their bodies. Lice are generated out of the flesh of animals.

When lice are coming there is a kind of small eruption visible, unaccompanied by any discharge of purulent matter; and, if you prick an animal when in this condition at the spot of eruption, the lice jump out. In some men the appearance of lice is a disease, in cases where the body is surcharged with moisture; and, indeed, men have been known to succumb to this louse-disease, as Alcmeon the poet and the Syrian Pherecydes are said to have done. Moreover, in certain diseases lice appear in great abundance.

There is also a species of louse called the 'wild louse', and this is harder than the ordinary louse, and there is exceptional difficulty in getting the skin rid of it. Boys' heads are apt to be

lousy, but men's in less degree; and women are more subject to lice than men. But, whenever people are troubled with lousy heads, they are less than ordinarily troubled with headache. And lice are generated in other animals than man. For birds are infested with them; and pheasants, unless they clean themselves in the dust, are actually destroyed by them. All other winged animals that are furnished with feathers are similarly infested, and all hair-coated creatures also, with the single exception of the ass, which is infested neither with lice nor with ticks.

Cattle suffer both from lice and from ticks. Sheep and goats breed ticks, but do not breed lice. Pigs breed lice large and hard. In dogs are found the flea peculiar to the animal, the Cynoroestes. In all animals that are subject to lice, the latter originate from the animals themselves. Moreover, in animals that bathe at all, lice are more than usually abundant when they change the water in which they bathe.

In the sea, lice are found on fishes, but they are generated not out of the fish but out of slime; and they resemble multipedal wood-lice, only that their tail is flat. Sea-lice are uniform in shape and universal in locality, and are particularly numerous on the body of the red mullet. And all these insects are multipedal and devoid of blood.

The parasite that feeds on the tunny is found in the region of the fins; it resembles a scorpion, and is about the size of a spider. In the seas between Cyrene and Egypt there is a fish that attends on the dolphin, which is called the 'dolphin's louse'. This fish gets exceedingly fat from enjoying an abundance of food while the dolphin is out in pursuit of its prey.

32

Other animalcules besides these are generated, as we have already remarked, some in wool or in articles made of wool, as the ses or clothes-moth. And these animalcules come in greater numbers if the woollen substances are dusty; and they come in especially large numbers if a spider be shut up in the cloth or wool, for the creature drinks up any moisture that may be there, and dries up the woollen substance. This grub is found also in men's clothes.

A creature is also found in wax long laid by, just as in wood, and it is the smallest of animalcules and is white in colour, and is designated the acari or mite. In books also other animalcules are found, some resembling the grubs found in garments, and some resembling tailless scorpions, but very small. As a general rule we may state that such animalcules are found in practically anything, both in dry things that are becoming moist and in moist things that are drying, provided they contain the conditions of life.

There is a grub entitled the 'faggot-bearer', as strange a creature as is known. Its head projects outside its shell, mottled in colour, and its feet are near the end or apex, as is the case with grubs in general; but the rest of its body is cased in a tunic as it were of spider's web, and there are little dry twigs about it, that look as though they had stuck by accident to the creature as it went walking about. But these twig-like formations are naturally connected with the tunic, for just as the shell is with the body of the snail so is the whole superstructure with our grub; and they do not drop off, but can only be torn off, as though they were all of a piece with him, and the removal of the tunic is as fatal to this grub as the removal of the shell would be to the snail. In course of time this grub becomes a chrysalis, as is the case with the silkworm, and lives in a motionless

condition. But as yet it is not known into what winged condition it is transformed.

The fruit of the wild fig contains the psen, or fig-wasp. This creature is a grub at first; but in due time the husk peels off and the psen leaves the husk behind it and flies away, and enters into the fruit of the fig-tree through its orifice, and causes the fruit not to drop off; and with a view to this phenomenon, country folk are in the habit of tying wild figs on to fig-trees, and of planting wild fig-trees near domesticated ones.

33

In the case of animals that are quadrupeds and red-blooded and oviparous, generation takes place in the spring, but copulation does not take place in an uniform season. In some cases it takes place in the spring, in others in summer time, and in others in the autumn, according as the subsequent season may be favourable for the young.

The tortoise lays eggs with a hard shell and of two colours within, like birds' eggs, and after laying them buries them in the ground and treads the ground hard over them; it then broods over the eggs on the surface of the ground, and hatches the eggs the next year. The hemys, or fresh-water tortoise, leaves the water and lays its eggs. It digs a hole of a casklike shape, and deposits therein the eggs; after rather less than thirty days it digs the eggs up again and hatches them with great rapidity, and leads its young at once off to the water. The sea-turtle lays on the ground eggs just like the eggs of domesticated birds, buries the eggs in the ground, and broods over them in the night-time. It lays a very great number of eggs, amounting at times to one hundred.

Lizards and crocodiles, terrestrial and fluvial, lay eggs on land. The eggs of lizards hatch spontaneously on land, for the lizard does not live on into the next year; in fact, the life of the animal is said not to exceed six months. The river-crocodile lays a number of eggs, sixty at the most, white in colour, and broods over them for sixty days: for, by the way, the creature is very long-lived. And the disproportion is more marked in this animal than in any other between the smallness of the original egg and the huge size of the full-grown animal. For the egg is not larger than that of the goose, and the young crocodile is small, answering to the egg in size, but the full-grown animal attains the length of twenty-six feet; in fact, it is actually stated that the animal goes on growing to the end of its days.

34

With regard to serpents or snakes, the viper is externally viviparous, having been previously oviparous internally. The egg, as with the egg of fishes, is uniform in colour and soft-skinned. The young serpent grows on the surface of the egg, and, like the young of fishes, has no shell-like envelopment. The young of the viper is born inside a membrane that bursts from off the young creature in three days; and at times the young viper eats its way out from the inside of the egg. The mother viper brings forth all its young in one day, twenty in number, and one at a time. The other serpents are externally oviparous, and their eggs are strung on to one another like a lady's necklace; after the dam has laid her eggs in the ground she broods over them, and hatches the eggs in the following year.

Book VI

1

So much for the generative processes in snakes and insects, and also in oviparous quadrupeds. Birds without exception lay eggs, but the pairing season and the times of parturition are not alike for all. Some birds couple and lay at almost any time in the year, as for instance the barn-door hen and the pigeon: the former of these coupling and laying during the entire year, with the exception of the month before and the month after the winter solstice. Some hens, even in the high breeds, lay a large quantity of eggs before brooding, amounting to as many as sixty; and, by the way, the higher breeds are less prolific than the inferior ones. The Adrian hens are small-sized, but they lay every day; they are cross-tempered, and often kill their chickens; they are of all colours. Some domesticated hens lay twice a day; indeed, instances have been known where hens, after exhibiting extreme fecundity, have died suddenly. Hens, then, lay eggs, as has been stated, at all times indiscriminately; the pigeon, the ring-dove, the turtle-dove, and the stock-dove lay twice a year, and the pigeon actually lays ten times a year. The great majority of birds lay during the spring-time. Some birds are prolific, and prolific in either of two ways – either by laying often, as the pigeon, or by laying many eggs at a sitting, as the barn-door hen. All birds of prey, or birds with crooked talons, are unprolific, except the kestrel: this bird is the most prolific of birds of prey; as many as four eggs have been observed in the nest, and occasionally it lays even more.

Birds in general lay their eggs in nests, but such as are disqualified for flight, as the partridge and the quail, do not lay them in nests but on the ground, and cover them over with loose material. The same is the case with the lark and the tetrix. These birds hatch in sheltered places; but the bird called merops in Boeotia, alone of all birds, burrows into holes in the ground and hatches there.

Thrushes, like swallows, build nests of clay, on high trees, and build them in rows all close together, so that from their continuity the structure resembles a necklace of nests. Of all birds that hatch for themselves the hoopoe is the only one that builds no nest whatever; it gets into the hollow of the trunk of a tree, and lays its eggs there without making any sort of nest. The circus builds either under a dwelling-roof or on cliffs. The tetrix, called ourax in Athens, builds neither on the ground nor on trees, but on low-lying shrubs.

2

The egg in the case of all birds alike is hard-shelled, if it be the produce of copulation and be laid by a healthy hen – for some hens lay soft eggs. The interior of the egg is of two colours, and the white part is outside and the yellow part within.

The eggs of birds that frequent rivers and marshes differ from those of birds that live on dry land; that is to say, the eggs of waterbirds have comparatively more of the yellow or yolk and less of the white. Eggs vary in colour according to their kind. Some eggs are white, as those of the pigeon and of the partridge; others are yellowish, as the eggs of marsh birds; in some cases the eggs are mottled, as the eggs of the guinea-fowl

and the pheasant; while the eggs of the kestrel are red, like vermilion.

Eggs are not symmetrically shaped at both ends: in other words, one end is comparatively sharp, and the other end is comparatively blunt; and it is the latter end that protrudes first at the time of laying. Long and pointed eggs are female; those that are round, or more rounded at the narrow end, are male. Eggs are hatched by the incubation of the mother-bird. In some cases, as in Egypt, they are hatched spontaneously in the ground, by being buried in dung heaps. A story is told of a toper in Syracuse, how he used to put eggs into the ground under his rush-mat and to keep on drinking until he hatched them. Instances have occurred of eggs being deposited in warm vessels and getting hatched spontaneously.

The sperm of birds, as of animals in general, is white. After the female has submitted to the male, she draws up the sperm to underneath her midriff. At first it is little in size and white in colour; by and by it is red, the colour of blood; as it grows, it becomes pale and yellow all over. When at length it is getting ripe for hatching, it is subject to differentiation of substance, and the yolk gathers together within and the white settles round it on the outside. When the full time is come, the egg detaches itself and protrudes, changing from soft to hard with such temporal exactitude that, whereas it is not hard during the process of protrusion, it hardens immediately after the process is completed: that is if there be no concomitant pathological circumstances. Cases have occurred where substances resembling the egg at a critical point of its growth – that is, when it is yellow all over, as the yolk is subsequently – have been found in the cock when cut open, underneath his midriff, just where the hen has her eggs; and these are entirely yellow in appearance and of the same size as ordinary eggs. Such phenomena are regarded as unnatural and portentous.

Such as affirm that wind-eggs are the residua of eggs previously begotten from copulation are mistaken in this assertion, for we have cases well authenticated where chickens of the common hen and goose have laid wind-eggs without ever having been subjected to copulation. Wind-eggs are smaller, less palatable, and more liquid than true eggs, and are produced in greater numbers. When they are put under the mother bird, the liquid contents never coagulate, but both the yellow and the white remain as they were. Wind-eggs are laid by a number of birds: as for instance by the common hen, the hen partridge, the hen pigeon, the peahen, the goose, and the vulpanser. Eggs are hatched under brooding hens more rapidly in summer than in winter; that is to say, hens hatch in eighteen days in summer, but occasionally in winter take as many as twenty-five. And by the way for brooding purposes some birds make better mothers than others. If it thunders while a hen-bird is brooding, the eggs get addled. Wind-eggs that are called by some cynosura and uria are produced chiefly in summer. Wind-eggs are called by some zephyr-eggs, because at spring-time hen-birds are observed to inhale the breezes; they do the same if they be stroked in a peculiar way by hand. Wind-eggs can turn into fertile eggs, and eggs due to previous copulation can change breed, if before the change of the yellow to the white the hen that contains wind-eggs, or eggs begotten of copulation be trodden by another cock-bird. Under these circumstances the wind-eggs turn into fertile eggs, and the previously impregnated eggs follow the breed of the impregnator; but if the latter impregnation takes place during the change of the yellow to the white, then no change in the egg takes place: the wind-egg does not become a true egg, and the true egg does not take on the breed of the latter impregnator. If when the egg-substance is small copulation be intermitted, the previously existing egg-substance exhibits no increase; but if the hen be again submitted to the male the increase in size proceeds with rapidity.

The yolk and the white are diverse not only in colour but also in properties. Thus, the yolk congeals under the influence of cold, whereas the white instead of congealing is inclined rather to liquefy. Again, the white stiffens under the influence of fire, whereas the yolk does not stiffen; but, unless it be burnt through and through, it remains soft, and in point of fact is inclined to set or to harden more from the boiling than from the roasting of the egg. The yolk and the white are separated by a membrane from one another. The so-called 'hail-stones', or treadles, that are found at the extremity of the yellow in no way contribute towards generation, as some erroneously suppose: they are two in number, one below and the other above. If you take out of the shells a number of yolks and a number of whites and pour them into a sauce pan and boil them slowly over a low fire, the yolks will gather into the centre and the whites will set all around them.

Young hens are the first to lay, and they do so at the beginning of spring and lay more eggs than the older hens, but the eggs of the younger hens are comparatively small. As a general rule, if hens get no brooding they pine and sicken. After copulation hens shiver and shake themselves, and often kick rubbish about all round them – and this, by the way, they do sometimes after laying – whereas pigeons trail their rumps on the ground, and geese dive under the water. Conception of the true egg and conformation of the wind-egg take place rapidly with most birds; as for instance with the hen-partridge when in heat. The fact is that, when she stands to windward and within scent of the male, she conceives, and becomes useless for decoy purposes: for, by the way, the partridge appears to have a very acute sense of smell.

The generation of the egg after copulation and the generation of the chick from the subsequent hatching of the egg are not brought about within equal periods for all birds, but differ as to

time according to the size of the parent-birds. The egg of the common hen after copulation sets and matures in ten days a general rule; the egg of the pigeon in a somewhat lesser period. Pigeons have the faculty of holding back the egg at the very moment of parturition; if a hen pigeon be put about by any one, for instance if it be disturbed on its nest, or have a feather plucked out, or sustain any other annoyance or disturbance, then even though she had made up her mind to lay she can keep the egg back in abeyance. A singular phenomenon is observed in pigeons with regard to pairing: that is, they kiss one another just when the male is on the point of mounting the female, and without this preliminary the male would decline to perform his function. With the older males the preliminary kiss is only given to begin with, and subsequently sequently he mounts without previously kissing; with younger males the preliminary is never omitted. Another singularity in these birds is that the hens tread one another when a cock is not forthcoming, after kissing one another just as takes place in the normal pairing. Though they do not impregnate one another they lay more eggs under these than under ordinary circumstances; no chicks, however, result therefrom, but all such eggs are wind-eggs.

3

Generation from the egg proceeds in an identical manner with all birds, but the full periods from conception to birth differ, as has been said. With the common hen after three days and three nights there is the first indication of the embryo; with larger birds the interval being longer, with smaller birds shorter. Meanwhile the yolk comes into being, rising towards the sharp end, where the primal element of the egg is situated, and where

the egg gets hatched; and the heart appears, like a speck of blood, in the white of the egg. This point beats and moves as though endowed with life, and from it two vein-ducts with blood in them trend in a convoluted course (as the egg substance goes on growing, towards each of the two circumjacent integuments); and a membrane carrying bloody fibres now envelops the yolk, leading off from the vein-ducts. A little afterwards the body is differentiated, at first very small and white. The head is clearly distinguished, and in it the eyes, swollen out to a great extent. This condition of the eyes lat on for a good while, as it is only by degrees that they diminish in size and collapse. At the outset the under portion of the body appears insignificant in comparison with the upper portion. Of the two ducts that lead from the heart, the one proceeds towards the circumjacent integument, and the other, like a navel-string, towards the yolk. The life-element of the chick is in the white of the egg, and the nutriment comes through the navel-string out of the yolk.

When the egg is now ten days old the chick and all its parts are distinctly visible. The head is still larger than the rest of its body, and the eyes larger than the head, but still devoid of vision. The eyes, if removed about this time, are found to be larger than beans, and black; if the cuticle be peeled off them there is a white and cold liquid inside, quite glittering in the sunlight, but there is no hard substance whatsoever. Such is the condition of the head and eyes. At this time also the larger internal organs are visible, as also the stomach and the arrangement of the viscera; and veins that seem to proceed from the heart are now close to the navel. From the navel there stretch a pair of veins; one towards the membrane that envelops the yolk (and, by the way, the yolk is now liquid, or more so than is normal), and the other towards that membrane which envelops collectively the membrane wherein the chick lies, the membrane of the yolk, and the intervening liquid. (For, as the chick grows, little by little

one part of the yolk goes upward, and another part downward, and the white liquid is between them; and the white of the egg is underneath the lower part of the yolk, as it was at the outset.) On the tenth day the white is at the extreme outer surface, reduced in amount, glutinous, firm in substance, and sallow in colour.

The disposition of the several constituent parts is as follows. First and outermost comes the membrane of the egg, not that of the shell, but underneath it. Inside this membrane is a white liquid; then comes the chick, and a membrane round about it, separating it off so as to keep the chick free from the liquid; next after the chick comes the yolk, into which one of the two veins was described as leading, the other one leading into the enveloping white substance. (A membrane with a liquid resembling serum envelops the entire structure. Then comes another membrane right round the embryo, as has been described, separating it off against the liquid. Underneath this comes the yolk, enveloped in another membrane (into which yolk proceeds the navel-string that leads from the heart and the big vein), so as to keep the embryo free of both liquids.)

About the twentieth day, if you open the egg and touch the chick, it moves inside and chirps; and it is already coming to be covered with down, when, after the twentieth day is ast, the chick begins to break the shell. The head is situated over the right leg close to the flank, and the wing is placed over the head; and about this time is plain to be seen the membrane resembling an after-birth that comes next after the outermost membrane of the shell, into which membrane the one of the navel-strings was described as leading (and, by the way, the chick in its entirety is now within it), and so also is the other membrane resembling an after-birth, namely that surrounding the yolk, into which the second navel-string was described as leading; and both of them were described as being connected

with the heart and the big vein. At this conjuncture the navel-string that leads to the outer afterbirth collapses and becomes detached from the chick, and the membrane that leads into the yolk is fastened on to the thin gut of the creature, and by this time a considerable amount of the yolk is inside the chick and a yellow sediment is in its stomach. About this time it discharges residuum in the direction of the outer after-birth, and has residuum inside its stomach; and the outer residuum is white (and there comes a white substance inside). By and by the yolk, diminishing gradually in size, at length becomes entirely used up and comprehended within the chick (so that, ten days after hatching, if you cut open the chick, a small remnant of the yolk is still left in connexion with the gut), but it is detached from the navel, and there is nothing in the interval between, but it has been used up entirely. During the period above referred to the chick sleeps, wakes up, makes a move and looks up and Chirps; and the heart and the navel together palpitate as though the creature were respiring. So much as to generation from the egg in the case of birds.

Birds lay some eggs that are unfruitful, even eggs that are the result of copulation, and no life comes from such eggs by incubation; and this phenomenon is observed especially with pigeons.

Twin eggs have two yolks. In some twin eggs a thin partition of white intervenes to prevent the yolks mixing with each other, but some twin eggs are unprovided with such partition, and the yokes run into one another. There are some hens that lay nothing but twin eggs, and in their case the phenomenon regarding the yolks has been observed. For instance, a hen has been known to lay eighteen eggs, and to hatch twins out of them all, except those that were wind-eggs; the rest were fertile (though, by the way, one of the twins is always bigger than the other), but the eighteenth was abnormal or monstrous.

4

Birds of the pigeon kind, such as the ringdove and the turtle-dove, lay two eggs at a time; that is to say, they do so as a general rule, and they never lay more than three. The pigeon, as has been said, lays at all seasons; the ring-dove and the turtle-dove lay in the springtime, and they never lay more than twice in the same season. The hen-bird lays the second pair of eggs when the first pair happens to have been destroyed, for many of the hen-pigeons destroy the first brood. The hen-pigeon, as has been said, occasionally lays three eggs, but it never rears more than two chicks, and sometimes rears only one; and the odd one is always a wind-egg.

Very few birds propagate within their first year. All birds, after once they have begun laying, keep on having eggs, though in the case of some birds it is difficult to detect the fact from the minute size of the creature.

The pigeon, as a rule, lays a male and a female egg, and generally lays the male egg first; after laying it allows a day's interval to ensue and then lays the second egg. The male takes its turn of sitting during the daytime; the female sits during the night. The first-laid egg is hatched and brought to birth within twenty days; and the mother bird pecks a hole in the egg the day before she hatches it out. The two parent birds brood for some time over the chicks in the way in which they brooded previously over the eggs. In all connected with the rearing of the young the female parent is more cross-tempered than the male, as is the case with most animals after parturition. The hens lay as many as ten times in the year; occasional instances have been known of their laying eleven times, and in Egypt they

actually lay twelve times. The pigeon, male and female, couples within the year; in fact, it couples when only six months old. Some assert that ringdoves and turtle-doves pair and procreate when only three months old, and instance their superabundant numbers by way of proof of the assertion. The hen-pigeon carries her eggs fourteen days; for as many more days the parent birds hatch the eggs; by the end of another fourteen days the chicks are so far capable of flight as to be overtaken with difficulty. (The ring-dove, according to all accounts, lives up to forty years. The partridge lives over sixteen.) (After one brood the pigeon is ready for another within thirty days.)

5

The vulture builds its nest on inaccessible cliffs; for which reason its nest and young are rarely seen. And therefore Herodorus, father of Bryson the Sophist, declares that vultures belong to some foreign country unknown to us, stating as a proof of the assertion that no one has ever seen a vulture's nest, and also that vultures in great numbers make a sudden appearance in the rear of armies. However, difficult as it is to get a sight of it, a vulture's nest has been seen. The vulture lays two eggs.

(Carnivorous birds in general are observed to lay but once a year. The swallow is the only carnivorous bird that builds a nest twice. If you prick out the eyes of swallow chicks while they are yet young, the birds will get well again and will see by and by.)

6

The eagle lays three eggs and hatches two of them, as it is said in the verses ascribed to Musaeus:

That lays three, hatches two, and cares for one.

This is the case in most instances, though occasionally a brood of three has been observed. As the young ones grow, the mother becomes wearied with feeding them and extrudes one of the pair from the nest. At the same time the bird is said to abstain from food, to avoid harrying the young of wild animals. That is to say, its wings blanch, and for some days its talons get turned awry. It is in consequence about this time cross-tempered to its own young. The phene is said to rear the young one that has been expelled the nest. The eagle broods for about thirty days.

The hatching period is about the same for the larger birds, such as the goose and the great bustard; for the middle-sized birds it extends over about twenty days, as in the case of the kite and the hawk. The kite in general lays two eggs, but occasionally rears three young ones. The so-called aegolius at times rears four. It is not true that, as some aver, the raven lays only two eggs; it lays a larger number. It broods for about twenty days and then extrudes its young. Other birds perform the same operation; at all events mother birds that lay several eggs often extrude one of their young.

Birds of the eagle species are not alike in the treatment of their young. The white-tailed eagle is cross, the black eagle is affectionate in the feeding of the young; though, by the way, all birds of prey, when their brood is rather forward in being able to fly, beat and extrude them from the nest. The majority of birds other than birds of prey, as has been said, also act in this manner, and after feeding their young take no further care of them; but the crow is an exception. This bird for a considerable

time takes charge of her young; for, even when her young can fly, she flies alongside of them and supplies them with food.

7

The cuckoo is said by some to be a hawk transformed, because at the time of the cuckoo's coming, the hawk, which it resembles, is never seen; and indeed it is only for a few days that you will see hawks about when the cuckoo's note sounds early in the season. The cuckoo appears only for a short time in summer, and in winter disappears. The hawk has crooked talons, which the cuckoo has not; neither with regard to the head does the cuckoo resemble the hawk. In point of fact, both as regards the head and the claws it more resembles the pigeon. However, in colour and in colour alone it does resemble the hawk, only that the markings of the hawk are striped, and of the cuckoo mottled. And, by the way, in size and flight it resembles the smallest of the hawk tribe, which bird disappears as a rule about the time of the appearance of the cuckoo, though the two have been seen simultaneously. The cuckoo has been seen to be preyed on by the hawk; and this never happens between birds of the same species. They say no one has ever seen the young of the cuckoo. The bird eggs, but does not build a nest. Sometimes it lays its eggs in the nest of a smaller bird after first devouring the eggs of this bird; it lays by preference in the nest of the ringdove, after first devouring the eggs of the pigeon. (It occasionally lays two, but usually one.) It lays also in the nest of the hypolais, and the hypolais hatches and rears the brood. It is about this time that the bird becomes fat and palatable. (The young of hawks also get palatable and fat. One species builds a nest in the wilderness and on sheer and inaccessible cliffs.)

8

With most birds, as has been said of the pigeon, the hatching is carried on by the male and the female in turns: with some birds, however, the male only sits long enough to allow the female to provide herself with food. In the goose tribe the female alone incubates, and after once sitting on the eggs she continues brooding until they are hatched.

The nests of all marsh-birds are built in districts fenny and well supplied with grass; consequently, the mother-bird while sitting quiet on her eggs can provide herself with food without having to submit to absolute fasting.

With the crow also the female alone broods, and broods throughout the whole period; the male bird supports the female, bringing her food and feeding her. The female of the ring-dove begins to brood in the afternoon and broods through the entire night until breakfast-time of the following day; the male broods during the rest of the time. Partridges build a nest in two compartments; the male broods on the one and the female on the other. After hatching, each of the parent birds rears its brood. But the male, when he first takes his young out of the nest, treads them.

9

Peafowl live for about twenty-five years, breed about the third year, and at the same time take on their spangled plumage. They hatch their eggs within thirty days or rather more. The

peahen lays but once a year, and lays twelve eggs, or may be a slightly lesser number: she does not lay all the eggs there and then one after the other, but at intervals of two or three days. Such as lay for the first time lay about eight eggs. The peahen lays wind-eggs. They pair in the spring; and laying begins immediately after pairing. The bird moults when the earliest trees are shedding their leaves, and recovers its plumage when the same trees are recovering their foliage. People that rear peafowl put the eggs under the barn-door hen, owing to the fact that when the peahen is brooding over them the peacock attacks her and tries to trample on them; owing to this circumstance some birds of wild varieties run away from the males and lay their eggs and brood in solitude. Only two eggs are put under a barn-door hen, for she could not brood over and hatch a large number. They take every precaution, by supplying her with food, to prevent her going off the eggs and discontinuing the brooding.

With male birds about pairing time the testicles are obviously larger than at other times, and this is conspicuously the case with the more salacious birds, such as the barn-door cock and the cock partridge; the peculiarity is less conspicuous in such birds as are intermittent in regard to pairing.

10

So much for the conception and generation of birds.

It has been previously stated that fishes are not all oviparous. Fishes of the cartilaginous genus are viviparous; the rest are oviparous. And cartilaginous fishes are first oviparous internally and subsequently viviparous; they rear the embryos internally, the batrachus or fishing-frog being an exception.

Fishes also, as was above stated, are provided with wombs, and wombs of diverse kinds. The oviparous genera have wombs bifurcate in shape and low down in position; the cartilaginous genus have wombs shaped like those of O birds. The womb, however, in the cartilaginous fishes differs in this respect from the womb of birds, that with some cartilaginous fishes the eggs do not settle close to the diaphragm but middle-ways along the backbone, and as they grow they shift their position.

The egg with all fishes is not of two colours within but is of even hue; and the colour is nearer to white than to yellow, and that both when the young is inside it and previously as well.

Development from the egg in fishes differs from that in birds in this respect, that it does not exhibit that one of the two navel-strings that leads off to the membrane that lies close under the shell, while it does exhibit that one of the two that in the case of birds leads off to the yolk. In a general way the rest of the development from the egg onwards is identical in birds and fishes. That is to say, development takes place at the upper part of the egg, and the veins extend in like manner, at first from the heart; and at first the head, the eyes, and the upper parts are largest; and as the creature grows the egg-substance decreases and eventually disappears, and becomes absorbed within the embryo, just as takes place with the yolk in birds.

The navel-string is attached a little way below the aperture of the belly. When the creatures are young the navel-string is long, but as they grow it diminishes in size; at length it gets small and becomes incorporated, as was described in the case of birds. The embryo and the egg are enveloped by a common membrane, and just under this is another membrane that envelops the embryo by itself; and in between the two membranes is a liquid. The food inside the stomach of the little

fishes resembles that inside the stomach of young chicks, and is partly white and partly yellow.

As regards the shape of the womb, the reader is referred to my treatise on Anatomy. The womb, however, is diverse in diverse fishes, as for instance in the sharks as compared one with another or as compared with the skate. That is to say, in some sharks the eggs adhere in the middle of the womb round about the backbone, as has been stated, and this is the case with the dog-fish; as the eggs grow they shift their place; and since the womb is bifurcate and adheres to the midriff, as in the rest of similar creatures, the eggs pass into one or other of the two compartments. This womb and the womb of the other sharks exhibit, as you go a little way off from the midriff, something resembling white breasts, which never make their appearance unless there be conception.

Dog-fish and skate have a kind of egg-shell, in the which is found an egg-like liquid. The shape of the egg-shell resembles the tongue of a bagpipe, and hair-like ducts are attached to the shell. With the dog-fish which is called by some the ‘dappled shark’, the young are born when the shell-formation breaks in pieces and falls out; with the ray, after it has laid the egg the shell-formation breaks up and the young move out. The spiny dog-fish has its close to the midriff above the breast like formations; when the egg descends, as soon as it gets detached the young is born. The mode of generation is the same in the case of the fox-shark.

The so-called smooth shark has its eggs in betwixt the wombs like the dog-fish; these eggs shift into each of the two horns of the womb and descend, and the young develop with the navel-string attached to the womb, so that, as the egg-substance gets used up, the embryo is sustained to all appearance just as in the case of quadrupeds. The navel-string is long and adheres to the

under part of the womb (each navel-string being attached as it were by a sucker), and also to the centre of the embryo in the place where the liver is situated. If the embryo be cut open, even though it has the egg-substance no longer, the food inside is egg-like in appearance. Each embryo, as in the case of quadrupeds, is provided with a chorion and separate membranes. When young the embryo has its head upwards, but downwards when it gets strong and is completed in form. Males are generated on the left-hand side of the womb, and females on the right-hand side, and males and females on the same side together. If the embryo be cut open, then, as with quadrupeds, such internal organs as it is furnished with, as for instance the liver, are found to be large and supplied with blood.

All cartilaginous fishes have at one and the same time eggs above close to the midriff (some larger, some smaller), in considerable numbers, and also embryos lower down. And this circumstance leads many to suppose that fishes of this species pair and bear young every month, inasmuch as they do not produce all their young at once, but now and again and over a lengthened period. But such eggs as have come down below within the womb are simultaneously ripened and completed in growth.

Dog-fish in general can extrude and take in again their young, as can also the angel-fish and the electric ray – and, by the way, a large electric ray has been seen with about eighty embryos inside it – but the spiny dogfish is an exception to the rule, being prevented by the spine of the young fish from so doing. Of the flat cartilaginous fish, the trygon and the ray cannot extrude and take in again in consequence of the roughness of the tails of the young. The batrachus or fishing-frog also is unable to take in its young owing to the size of the head and the prickles; and, by the way, as was previously remarked, it is the only one of these fishes that is not viviparous.

So much for the varieties of the cartilaginous species and for their modes of generation from the egg.

11

At the breeding season the sperm-ducts of the male are filled with sperm, so much so that if they be squeezed the sperm flows out spontaneously as a white fluid; the ducts are bifurcate, and start from the midriff and the great vein. About this period the sperm-ducts of the male are quite distinct (from the womb of the female) but at any other than the actual breeding time their distinctness is not obvious to a non-expert. The fact is that in certain fishes at certain times these organs are imperceptible, as was stated regarding the testicles of birds.

Among other distinctions observed between the thoric ducts and the womb-ducts is the circumstance that the thoric ducts are attached to the loins, while the womb-ducts move about freely and are attached by a thin membrane. The particulars regarding the thoric ducts may be studied by a reference to the diagrams in my treatise on Anatomy.

Cartilaginous fishes are capable of superfoetation, and their period of gestation is six months at the longest. The so-called starry dogfish bears young the most frequently; in other words it bears twice a month. The breeding season is in the month of Maemacterion. The dog-fish as a general rule bear twice in the year, with the exception of the little dog-fish, which bears only once a year. Some of them bring forth in the springtime. The rhine, or angel-fish, bears its first brood in the springtime, and its second in the autumn, about the winter setting of the Pleiads; the second brood is the stronger of the two. The electric ray brings forth in the late autumn.

Cartilaginous fishes come out from the main seas and deep waters towards the shore and there bring forth their young, and they do so for the sake of warmth and by way of protection for their young.

Observations would lead to the general rule that no one variety of fish pairs with another variety. The angel-fish, however, and the batus or skate appear to pair with one another; for there is a fish called the rhinobatus, with the head and front parts of the skate and the after parts of the rhine or angel-fish, just as though it were made up of both fishes together.

Sharks then and their congeners, as the fox-shark and the dog-fish, and the flat fishes, such as the electric ray, the ray, the smooth skate, and the trygon, are first oviparous and then viviparous in the way above mentioned, (as are also the saw-fish and the ox-ray.)

12

The dolphin, the whale, and all the rest of the Cetacea, all, that is to say, that are provided with a blow-hole instead of gills, are viviparous. That is to say, no one of all these fishes is ever seen to be supplied with eggs, but directly with an embryo from whose differentiation comes the fish, just as in the case of mankind and the viviparous quadrupeds.

The dolphin bears one at a time generally, but occasionally two. The whale bears one or at the most two, generally two. The porpoise in this respect resembles the dolphin, and, by the way, it is in form like a little dolphin, and is found in the Euxine; it differs, however, from the dolphin as being less in size and

broader in the back; its colour is leaden-black. Many people are of opinion that the porpoise is a variety of the dolphin.

All creatures that have a blow-hole respire and inspire, for they are provided with lungs. The dolphin has been seen asleep with his nose above water, and when asleep he snores.

The dolphin and the porpoise are provided with milk, and suckle their young. They also take their young, when small, inside them. The young of the dolphin grow rapidly, being full grown at ten years of age. Its period of gestation is ten months. It brings forth its young summer, and never at any other season; (and, singularly enough, under the Dogstar it disappears for about thirty days). Its young accompany it for a considerable period; and, in fact, the creature is remarkable for the strength of its parental affection. It lives for many years; some are known to have lived for more than twenty-five, and some for thirty years; the fact is fishermen nick their tails sometimes and set them adrift again, and by this expedient their ages are ascertained.

The seal is an amphibious animal: that is to say, it cannot take in water, but breathes and sleeps and brings forth on dry land – only close to the shore – as being an animal furnished with feet; it spends, however, the greater part of its time in the sea and derives its food from it, so that it must be classed in the category of marine animals. It is viviparous by immediate conception and brings forth its young alive, and exhibits an after-birth and all else just like a ewe. It bears one or two at a time, and three at the most. It has two teats, and suckles its young like a quadruped. Like the human species it brings forth at all seasons of the year, but especially at the time when the earliest kids are forthcoming. It conducts its young ones, when they are about twelve days old, over and over again during the day down to the sea, accustoming them by slow degrees to the

water. It slips down steep places instead of walking, from the fact that it cannot steady itself by its feet. It can contract and draw itself in, for it is fleshy and soft and its bones are gristly. Owing to the flabbiness of its body it is difficult to kill a seal by a blow, unless you strike it on the temple. It looks like a cow. The female in regard to its genital organs resembles the female of the ray; in all other respects it resembles the female of the human species.

So much for the phenomena of generation and of parturition in animals that live in water and are viviparous either internally or externally.

13

Oviparous fishes have their womb bifurcate and placed low down, as was said previously – and, by the way, all scaly fish are oviparous, as the basse, the mullet, the grey mullet, and the etelis, and all the so-called white-fish, and all the smooth or slippery fish except the eel – and their roe is of a crumbling or granular substance. This appearance is due to the fact that the whole womb of such fishes is full of eggs, so that in little fishes there seem to be only a couple of eggs there; for in small fishes the womb is indistinguishable, from its diminutive size and thin contexture. The pairing of fishes has been discussed previously.

Fishes for the most part are divided into males and females, but one is puzzled to account for the erythrinus and the channa, for specimens of these species are never caught except in a condition of pregnancy.

With such fish as pair, eggs are the result of copulation, but such fish have them also without copulation; and this is shown

in the case of some river-fish, for the minnow has eggs when quite small, – almost, one may say, as soon as it is born. These fishes shed their eggs little by little, and, as is stated, the males swallow the greater part of them, and some portion of them goes to waste in the water; but such of the eggs as the female deposits on the spawning beds are saved. If all the eggs were preserved, each species would be infinite in number. The greater number of these eggs so deposited are not productive, but only those over which the male sheds the milt or sperm; for when the female has laid her eggs, the male follows and sheds its sperm over them, and from all the eggs so besprinkled young fishes proceed, while the rest are left to their fate.

The same phenomenon is observed in the case of molluscs also; for in the case of the cuttlefish or sepia, after the female has deposited her eggs, the male besprinkles them. It is highly probable that a similar phenomenon takes place in regard to molluscs in general, though up to the present time the phenomenon has been observed only in the case of the cuttlefish.

Fishes deposit their eggs close in to shore, the goby close to stones; and, by the way, the spawn of the goby is flat and crumbly. Fish in general so deposit their eggs; for the water close in to shore is warm and is better supplied with food than the outer sea, and serves as a protection to the spawn against the voracity of the larger fish. And it is for this reason that in the Euxine most fishes spawn near the mouth of the river Thermodon, because the locality is sheltered, genial, and supplied with fresh water.

Oviparous fish as a rule spawn only once a year. The little phycis or black goby is an exception, as it spawns twice; the male of the black goby differs from the female as being blacker and having larger scales.

Fishes then in general produce their young by copulation, and lay their eggs; but the pipefish, as some call it, when the time of parturition arrives, bursts in two, and the eggs escape out. For the fish has a diaphysis or cloven growth under the belly and abdomen (like the blind snakes), and, after it has spawned by the splitting of this diaphysis, the sides of the split grow together again.

Development from the egg takes place similarly with fishes that are oviparous internally and with fishes that are oviparous externally; that is to say, the embryo comes at the upper end of the egg and is enveloped in a membrane, and the eyes, large and spherical, are the first organs visible. From this circumstance it is plain that the assertion is untenable which is made by some writers, to wit, that the young of oviparous fishes are generated like the grubs of worms; for the opposite phenomena are observed in the case of these grubs, in that their lower extremities are the larger at the outset, and that the eyes and the head appear later on. After the egg has been used up, the young fishes are like tadpoles in shape, and at first, without taking any nutriment, they grow by sustenance derived from the juice oozing from the egg; by and by, they are nourished up to full growth by the river-waters.

When the Euxine is 'purged' a substance called phycus is carried into the Hellespont, and this substance is of a pale yellow colour. Some writers aver that it is the flower of the phycus, from which rouge is made; it comes at the beginning of summer. Oysters and the small fish of these localities feed on this substance, and some of the inhabitants of these maritime districts say that the purple murex derives its peculiar colour from it.

14

Marsh-fishes and river-fishes conceive at the age of five months as a general rule, and deposit their spawn towards the close of the year without exception. And with these fishes, like as with the marine fishes, the female does not void all her eggs at one time, nor the male his sperm; but they are at all times more or less provided, the female with eggs, and the male with sperm. The carp spawns as the seasons come round, five or six times, and follows in spawning the rising of the greater constellations. The chalcis spawns three times, and the other fishes once only in the year. They all spawn in pools left by the overflowing of rivers, and near to reedy places in marshes; as for instance the phoxinus or minnow and the perch.

The glanis or sheat-fish and the perch deposit their spawn in one continuous string, like the frog; so continuous, in fact, is the convoluted spawn of the perch that, by reason of its smoothness, the fishermen in the marshes can unwind it off the reeds like threads off a reel. The larger individuals of the sheat-fish spawn in deep waters, some in water of a fathom's depth, the smaller in shallower water, generally close to the roots of the willow or of some other tree, or close to reeds or to moss. At times these fishes intertwine with one another, a big with a little one, and bring into juxtaposition the ducts – which some writers designate as navels – at the point where they emit the generative products and discharge the egg in the case of the female and the milt in the case of the male. Such eggs as are besprinkled with the milt grow, in a day or thereabouts, whiter and larger, and in a little while afterwards the fish's eyes become visible for these organs in all fishes, as for that matter in all other animals, are early conspicuous and seem disproportionately big. But such eggs as the milt fails to touch remain, as with marine fishes, useless and infertile. From the fertile eggs, as the little fish grow, a kind of sheath detaches

itself; this is a membrane that envelops the egg and the young fish. When the milt has mingled with the eggs, the resulting product becomes very sticky or viscous, and adheres to the roots of trees or wherever it may have been laid. The male keeps on guard at the principal spawning-place, and the female after spawning goes away.

In the case of the sheat-fish the growth from the egg is exceptionally slow, and, in consequence, the male has to keep watch for forty or fifty days to prevent the spawn being devoured by such little fishes as chance to come by. Next in point of slowness is the generation of the carp. As with fishes in general, so even with these, the spawn thus protected disappears and gets lost rapidly.

In the case of some of the smaller fishes when they are only three days old young fishes are generated. Eggs touched by the male sperm take on increase both the same day and also later. The egg of the sheat-fish is as big as a vetch-seed; the egg of the carp and of the carp-species as big as a millet-seed.

These fishes then spawn and generate in the way here described. The chalcis, however, spawns in deep water in dense shoals of fish; and the so-called tilon spawns near to beaches in sheltered spots in shoals likewise. The carp, the baleros, and fishes in general push eagerly into the shallows for the purpose of spawning, and very often thirteen or fourteen males are seen following a single female. When the female deposits her spawn and departs, the males follow on and shed the milt. The greater portion of the spawn gets wasted; because, owing to the fact that the female moves about while spawning, the spawn scatters, or so much of it as is caught in the stream and does not get entangled with some rubbish. For, with the exception of the sheatfish, no fish keeps on guard; unless, by the way, it be

the carp, which is said to remain on guard, if it so happen that its spawn lies in a solid mass.

All male fishes are supplied with milt, excepting the eel: with the eel, the male is devoid of milt, and the female of spawn. The mullet goes up from the sea to marshes and rivers; the eels, on the contrary, make their way down from the marshes and rivers to the sea.

15

The great majority of fish, then, as has been stated, proceed from eggs. However, there are some fish that proceed from mud and sand, even of those kinds that proceed also from pairing and the egg. This occurs in ponds here and there, and especially in a pond in the neighbourhood of Cnidos. This pond, it is said, at one time ran dry about the rising of the Dogstar, and the mud had all dried up; at the first fall of the rains there was a show of water in the pond, and on the first appearance of the water shoals of tiny fish were found in the pond. The fish in question was a kind of mullet, one which does not proceed from normal pairing, about the size of a small sprat, and not one of these fishes was provided with either spawn or milt. There are found also in Asia Minor, in rivers not communicating with the sea, little fishes like whitebait, differing from the small fry found near Cnidos but found under similar circumstances. Some writers actually aver that mullet all grow spontaneously. In this assertion they are mistaken, for the female of the fish is found provided with spawn, and the male with milt. However, there is a species of mullet that grows spontaneously out of mud and sand.

From the facts above enumerated it is quite proved that certain fishes come spontaneously into existence, not being derived from eggs or from copulation. Such fish as are neither oviparous nor viviparous arise all from one of two sources, from mud, or from sand and from decayed matter that rises thence as a scum; for instance, the so-called froth of the small fry comes out of sandy ground. This fry is incapable of growth and of propagating its kind; after living for a while it dies away and another creature takes its place, and so, with short intervals excepted, it may be said to last the whole year through. At all events, it lasts from the autumn rising of Arcturus up to the spring-time. As a proof that these fish occasionally come out of the ground we have the fact that in cold weather they are not caught, and that they are caught in warm weather, obviously coming up out of the ground to catch the heat; also, when the fishermen use dredges and the ground is scraped up fairly often, the fishes appear in larger numbers and of superior quality. All other small fry are inferior in quality owing to rapidity of growth. The fry are found in sheltered and marshy districts, when after a spell of fine weather the ground is getting warmer, as, for instance, in the neighbourhood of Athens, at Salamis and near the tomb of Themistocles and at Marathon; for in these districts the froth is found. It appears, then, in such districts and during such weather, and occasionally appears after a heavy fall of rain in the froth that is thrown up by the falling rain, from which circumstance the substance derives its specific name. Foam is occasionally brought in on the surface of the sea in fair weather. (And in this, where it has formed on the surface, the so-called froth collects, as grubs swarm in manure; for which reason this fry is often brought in from the open sea. The fish is at its best in quality and quantity in moist warm weather.)

The ordinary fry is the normal issue of parent fishes: the so-called gudgeon-fry of small insignificant gudgeon-like fish that

burrow under the ground. From the Phaleric fry comes the membras, from the membras the trichis, from the trichis the trichias, and from one particular sort of fry, to wit from that found in the harbour of Athens, comes what is called the encrasicholus, or anchovy. There is another fry, derived from the maenis and the mullet.

The unfertile fry is watery and keeps only a short time, as has been stated, for at last only head and eyes are left. However, the fishermen of late have hit upon a method of transporting it to a distance, as when salted it keeps for a considerable time.

16

Eels are not the issue of pairing, neither are they oviparous; nor was an eel ever found supplied with either milt or spawn, nor are they when cut open found to have within them passages for spawn or for eggs. In point of fact, this entire species of blooded animals proceeds neither from pair nor from the egg.

There can be no doubt that the case is so. For in some standing pools, after the water has been drained off and the mud has been dredged away, the eels appear again after a fall of rain. In time of drought they do not appear even in stagnant ponds, for the simple reason that their existence and sustenance is derived from rain-water.

There is no doubt, then, that they proceed neither from pairing nor from an egg. Some writers, however, are of opinion that they generate their kind, because in some eels little worms are found, from which they suppose that eels are derived. But this opinion is not founded on fact. Eels are derived from the so-called 'earth's guts' that grow spontaneously in mud and in

humid ground; in fact, eels have at times been seen to emerge out of such earthworms, and on other occasions have been rendered visible when the earthworms were laid open by either scraping or cutting. Such earthworms are found both in the sea and in rivers, especially where there is decayed matter: in the sea in places where sea-weed abounds, and in rivers and marshes near to the edge; for it is near to the water's edge that sun-heat has its chief power and produces putrefaction. So much for the generation of the eel.

17

Fish do not all bring forth their young at the same season nor all in like manner, neither is the period of gestation for all of the same duration.

Before pairing the males and females gather together in shoals; at the time for copulation and parturition they pair off. With some fishes the time of gestation is not longer than thirty days, with others it is a lesser period; but with all it extends over a number of days divisible by seven. The longest period of gestation is that of the species which some call a marinus.

The sargue conceives during the month of Poseideon (or December), and carries its spawn for thirty days; and the species of mullet named by some the chelon, and the myxon, go with spawn at the same period and over the same length of time.

All fish suffer greatly during the period of gestation, and are in consequence very apt to be thrown up on shore at this time. In some cases they are driven frantic with pain and throw themselves on land. At all events they are throughout this time

continually in motion until parturition is over (this being especially true of the mullet), and after parturition they are in repose. With many fish the time for parturition terminates on the appearance of grubs within the belly; for small living grubs get generated there and eat up the spawn.

With shoal fishes parturition takes place in the spring, and indeed, with most fishes, about the time of the spring equinox; with others it is at different times, in summer with some, and with others about the autumn equinox.

The first of shoal fishes to spawn is the atherine, and it spawns close to land; the last is the cephalus: and this is inferred from the fact that the brood of the atherine appears first of all and the brood of the cephalus last. The mullet also spawns early. The saupe spawns usually at the beginning of summer, but occasionally in the autumn. The aulopias, which some call the anthias, spawns in the summer. Next in order of spawning comes the chrysophrys or gilthead, the basse, the mormyrus, and in general such fish as are nicknamed 'runners'. Latest in order of the shoal fish come the red mullet and the coracine; these spawn in autumn. The red mullet spawns on mud, and consequently, as the mud continues cold for a long while, spawns late in the year. The coracine carries its spawn for a long time; but, as it lives usually on rocky ground, it goes to a distance and spawns in places abounding in seaweed, at a period later than the red mullet. The maenis spawns about the winter solstice. Of the others, such as are pelagic spawn for the most part in summer; which fact is proved by their not being caught by fishermen during this period.

Of ordinary fishes the most prolific is the sprat; of cartilaginous fishes, the fishing-frog. Specimens, however, of the fishing-frog are rare from the facility with which the young are destroyed, as the female lays her spawn all in a lump close in to shore. As a

rule, cartilaginous fish are less prolific than other fish owing to their being viviparous; and their young by reason of their size have a better chance of escaping destruction.

The so-called needle-fish (or pipe-fish) is late in spawning, and the greater portion of them are burst asunder by the eggs before spawning; and the eggs are not so many in number as large in size. The young fish cluster round the parent like so many young spiders, for the fish spawns on to herself; and, if any one touch the young, they swim away. The atherine spawns by rubbing its belly against the sand.

Tunny fish also burst asunder by reason of their fat. They live for two years; and the fishermen infer this age from the circumstance that once when there was a failure of the young tunny fish for a year there was a failure of the full-grown tunny the next summer. They are of opinion that the tunny is a fish a year older than the pelamyd. The tunny and the mackerel pair about the close of the month of Elaphebolion, and spawn about the commencement of the month of Hecatombaeon; they deposit their spawn in a sort of bag. The growth of the young tunny is rapid. After the females have spawned in the Euxine, there comes from the egg what some call scordylae, but what the Byzantines nickname the ‘auxids’ or ‘growers’, from their growing to a considerable size in a few days; these fish go out of the Pontus in autumn along with the young tunnies, and enter Pontus in the spring as pelamyds. Fishes as a rule take on growth with rapidity, but this is peculiarly the case with all species of fish found in the Pontus; the growth, for instance, of the amia-tunny is quite visible from day to day.

To resume, we must bear in mind that the same fish in the same localities have not the same season for pairing, for conception, for parturition, or for favouring weather. The coracine, for instance, in some places spawns about wheat-

harvest. The statements here given pretend only to give the results of general observation.

The conger also spawns, but the fact is not equally obvious in all localities, nor is the spawn plainly visible owing to the fat of the fish; for the spawn is lanky in shape as it is with serpents. However, if it be put on the fire it shows its nature; for the fat evaporates and melts, while the eggs dance about and explode with a crack. Further, if you touch the substances and rub them with your fingers, the fat feels smooth and the egg rough. Some congers are provided with fat but not with any spawn, others are unprovided with fat but have egg-spawn as here described.

18

We have, then, treated pretty fully of the animals that fly in the air or swim in the water, and of such of those that walk on dry land as are oviparous, to wit of their pairing, conception, and the like phenomena; it now remains to treat of the same phenomena in connexion with viviparous land animals and with man.

The statements made in regard to the pairing of the sexes apply partly to the particular kinds of animal and partly to all in general. It is common to all animals to be most excited by the desire of one sex for the other and by the pleasure derived from copulation. The female is most cross-tempered just after parturition, the male during the time of pairing; for instance, stallions at this period bite one another, throw their riders, and chase them. Wild boars, though usually enfeebled at this time as the result of copulation, are now unusually fierce, and fight with one another in an extraordinary way, clothing themselves with defensive armour, or in other words deliberately

thickening their hide by rubbing against trees or by coating themselves repeatedly all over with mud and then drying themselves in the sun. They drive one another away from the swine pastures, and fight with such fury that very often both combatants succumb. The case is similar with bulls, rams, and he-goats; for, though at ordinary times they herd together, at breeding time they hold aloof from and quarrel with one another. The male camel also is cross-tempered at pairing time if either a man or a camel comes near him; as for a horse, a camel is ready to fight him at any time. It is the same with wild animals. The bear, the wolf, and the lion are all at this time ferocious towards such as come in their way, but the males of these animals are less given to fight with one another from the fact that they are at no time gregarious. The she-bear is fierce after cubbing, and the bitch after pupping.

Male elephants get savage about pairing time, and for this reason it is stated that men who have charge of elephants in India never allow the males to have intercourse with the females; on the ground that the males go wild at this time and turn topsy-turvy the dwellings of their keepers, lightly constructed as they are, and commit all kinds of havoc. They also state that abundancy of food has a tendency to tame the males. They further introduce other elephants amongst the wild ones, and punish and break them in by setting on the new-comers to chastise the others.

Animals that pair frequently and not at a single specific season, as for instance animals domesticated by man, such as swine and dogs, are found to indulge in such freaks to a lesser degree owing to the frequency of their sexual intercourse.

Of female animals the mare is the most sexually wanton, and next in order comes the cow. In fact, the mare is said to go a-horsing; and the term derived from the habits of this one

animal serves as a term of abuse applicable to such females of the human species as are unbridled in the way of sexual appetite. This is the common phenomenon as observed in the sow when she is said to go a-boaring. The mare is said also about this time to get wind-impregnated if not impregnated by the stallion, and for this reason in Crete they never remove the stallion from the mares; for when the mare gets into this condition she runs away from all other horses. The mares under these circumstances fly invariably either northwards or southwards, and never towards either east or west. When this complaint is on them they allow no one to approach, until either they are exhausted with fatigue or have reached the sea. Under either of these circumstances they discharge a certain substance 'hippomanes', the title given to a growth on a new-born foal; this resembles the sow-virus, and is in great request amongst women who deal in drugs and potions. About horsing time the mares huddle closer together, are continually switching their tails, their neigh is abnormal in sound, and from the sexual organ there flows a liquid resembling genital sperm, but much thinner than the sperm of the male. It is this substance that some call hippomanes, instead of the growth found on the foal; they say it is extremely difficult to get as it oozes out only in small drops at a time. Mares also, when in heat, discharge urine frequently, and frisk with one another. Such are the phenomena connected with the horse.

Cows go a-bulling; and so completely are they under the influence of the sexual excitement that the herdsmen have no control over them and cannot catch hold of them in the fields. Mares and kine alike, when in heat, indicate the fact by the upraising of their genital organs, and by continually voiding urine. Further, kine mount the bulls, follow them about; and keep standing beside them. The younger females both with horses and oxen are the first to get in heat; and their sexual appetites are all the keener if the weather warm and their

bodily condition be healthy. Mares, when clipt of their coat, have the sexual feeling checked, and assume a downcast drooping appearance. The stallion recognizes by the scent the mares that form his company, even though they have been together only a few days before breeding time: if they get mixed up with other mares, the stallion bites and drives away the interlopers. He feeds apart, accompanied by his own troop of mares. Each stallion has assigned to him about thirty mares or even somewhat more; when a strange stallion approaches, he huddles his mares into a close ring, runs round them, then advances to the encounter of the newcomer; if one of the mares make a movement, he bites her and drives her back. The bull in breeding time begins to graze with the cows, and fights with other bulls (having hitherto grazed with them), which is termed by graziers 'herd-spurning'. Often in Epirus a bull disappears for three months together. In a general way one may state that of male animals either none or few herd with their respective females before breeding time; but they keep separate after reaching maturity, and the two sexes feed apart. Sows, when they are moved by sexual desire, or are, as it is called, a-boaring, will attack even human beings.

With bitches the same sexual condition is termed 'getting into heat'. The sexual organ rises at this time, and there is a moisture about the parts. Mares drip with a white liquid at this season.

Female animals are subject to menstrual discharges, but never in such-abundance as is the female of the human species. With ewes and she-goats there are signs of menstruation in breeding time, just before the for submitting to the male; after copulation also the signs are manifest, and then cease for an interval until the period of parturition arrives; the process then supervenes, and it is by this supervention that the shepherd knows that such and such an ewe is about to bring forth. After parturition

comes copious menstruation, not at first much tinged with blood, but deeply dyed with it by and by. With the cow, the she ass, and the mare, the discharge is more copious actually, owing to their greater bulk, but proportionally to the greater bulk it is far less copious. The cow, for instance, when in heat, exhibits a small discharge to the extent of a quarter of a pint of liquid or a little less; and the time when this discharge takes place is the best time for her to be covered by the bull. Of all quadrupeds the mare is the most easily delivered of its young, exhibits the least amount of discharge after parturition, and emits the least amount of blood; that is to say, of all animals in proportion to size. With kine and mares menstruation usually manifests itself at intervals of two, four, and six months; but, unless one be constantly attending to and thoroughly acquainted with such animals, it is difficult to verify the circumstance, and the result is that many people are under the belief that the process never takes place with these animals at all.

With mules menstruation never takes place, but the urine of the female is thicker than the urine of the male. As a general rule the discharge from the bladder in the case of quadrupeds is thicker than it is in the human species, and this discharge with ewes and she-goats is thicker than with rams and he-goats; but the urine of the jackass is thicker than the urine of the she-ass, and the urine of the bull is more pungent than the urine of the cow. After parturition the urine of all quadrupeds becomes thicker, especially with such animals as exhibit comparatively slight discharges. At breeding time the milk become purulent, but after parturition it becomes wholesome. During pregnancy ewes and she-goats get fatter and eat more; as is also the case with cows, and, indeed, with the females of all quadrupeds.

In general the sexual appetites of animals are keenest in spring-time; the time of pairing, however, is not the same for all, but is

adapted so as to ensure the rearing of the young at a convenient season.

Domesticated swine carry their young for four months, and bring forth a litter of twenty at the utmost; and, by the way, if the litter be exceedingly numerous they cannot rear all the young. As the sow grows old she continues to bear, but grows indifferent to the boar; she conceives after a single copulation, but they have to put the boar to her repeatedly owing to her dropping after intercourse what is called the sow-virus. This incident befalls all sows, but some of them discharge the genital sperm as well. During conception any one of the litter that gets injured or dwarfed is called an afterpig or scut: such injury may occur at any part of the womb. After littering the mother offers the foremost teat to the first-born. When the sow is in heat, she must not at once be put to the boar, but only after she lets her lugs drop, for otherwise she is apt to get into heat again; if she be put to the boar when in full condition of heat, one copulation, as has been said, is sufficient. It is as well to supply the boar at the period of copulation with barley, and the sow at the time of parturition with boiled barley. Some swine give fine litters only at the beginning, with others the litters improve as the mothers grow in age and size. It is said that a sow, if she have one of her eyes knocked out, is almost sure to die soon afterwards. Swine for the most part live for fifteen years, but some fall little short of the twenty.

19

Ewes conceive after three or four copulations with the ram. If rain falls after intercourse, the ram impregnates the ewe again; and it is the same with the she-goat. The ewe bears usually two

lambs, sometimes three or four. Both ewe and she-goat carry their young for five months; consequently wherever a district is sunny and the animals are used to comfort and well fed, they bear twice in the year. The goat lives for eight years and the sheep for ten, but in most cases not so long; the bell-wether, however, lives to fifteen years. In every flock they train one of the rams for bell-wether. When he is called on by name by the shepherd, he takes the lead of the flock: and to this duty the creature is trained from its earliest years. Sheep in Ethiopia live for twelve or thirteen years, goats for ten or eleven. In the case of the sheep and the goat the two sexes have intercourse all their lives long.

Twins with sheep and goats may be due to richness of pasturage, or to the fact that either the ram or the he-goat is a twin-begetter or that the ewe or the she-goat is a twin-bearer. Of these animals some give birth to males and others to females; and the difference in this respect depends on the waters they drink and also on the sires. And if they submit to the male when north winds are blowing, they are apt to bear males; if when south winds are blowing, females. Such as bear females may get to bear males, due regard being paid to their looking northwards when put to the male. Ewes accustomed to be put to the ram early will refuse him if he attempt to mount them late. Lambs are born white and black according as white or black veins are under the ram's tongue; the lambs are white if the veins are white, and black if the veins are black, and white and black if the veins are white and black; and red if the veins are red. The females that drink salted waters are the first to take the male; the water should be salted before and after parturition, and again in the springtime. With goats the shepherds appoint no bell-wether, as the animal is not capable of repose but frisky and apt to ramble. If at the appointed season the elders of the flock are eager for intercourse, the

shepherds say that it bodes well for the flock; if the younger ones, that the flock is going to be bad.

20

Of dogs there are several breeds. Of these the Laconian hound of either sex is fit for breeding purposes when eight months old: at about the same age some dogs lift the leg when voiding urine. The bitch conceives with one lining; this is clearly seen in the case where a dog contrives to line a bitch by stealth, as they impregnate after mounting only once. The Laconian bitch carries her young the sixth part of a year or sixty days: or more by one, two, or three, or less by one; the pups are blind for twelve days after birth. After pupping, the bitch gets in heat again in six months, but not before. Some bitches carry their young for the fifth part of the year or for seventy-two days; and their pups are blind for fourteen days. Other bitches carry their young for a quarter of a year or for three whole months; and the whelps of these are blind for seventeen days. The bitch appears go in heat for the same length of time. Menstruation continues for seven days, and a swelling of the genital organ occurs simultaneously; it is not during this period that the bitch is disposed to submit to the dog, but in the seven days that follow. The bitch as a rule goes in heat for fourteen days, but occasionally for sixteen. The birth-discharge occurs simultaneously with the delivery of the whelps, and the substance of it is thick and mucous. (The falling-off in bulk on the part of the mother is not so great as might have been inferred from the size of her frame.) The bitch is usually supplied with milk five days before parturition; some seven days previously, some four; and the milk is serviceable immediately after birth. The Laconian bitch is supplied with

milk thirty days after lining. The milk at first is thickish, but gets thinner by degrees; with the bitch the milk is thicker than with the female of any other animal excepting the sow and the hare. When the bitch arrives at full growth an indication is given of her capacity for the male; that is to say, just as occurs in the female of the human species, a swelling takes place in the teats of the breasts, and the breasts take on gristle. This incident, however, it is difficult for any but an expert to detect, as the part that gives the indication is inconsiderable. The preceding statements relate to the female, and not one of them to the male. The male as a rule lifts his leg to void urine when six months old; some at a later period, when eight months old, some before they reach six months. In a general way one may put it that they do so when they are out of puppyhood. The bitch squats down when she voids urine; it is a rare exception that she lifts the leg to do so. The bitch bears twelve pups at the most, but usually five or six; occasionally a bitch will bear one only. The bitch of the Laconian breed generally bears eight. The two sexes have intercourse with each other at all periods of life. A very remarkable phenomenon is observed in the case of the Laconian hound: in other words, he is found to be more vigorous in commerce with the female after being hard-worked than when allowed to live idle.

The dog of the Laconian breed lives ten years, and the bitch twelve. The bitch of other breeds usually lives for fourteen or fifteen years, but some live to twenty; and for this reason certain critics consider that Homer did well in representing the dog of Ulysses as having died in his twentieth year. With the Laconian hound, owing to the hardships to which the male is put, he is less long-lived than the female; with other breeds the distinction as to longevity is not very apparent, though as a general rule the male is the longer-lived.

The dog sheds no teeth except the so-called 'canines'; these a dog of either sex sheds when four months old. As they shed these only, many people are in doubt as to the fact, and some people, owing to their shedding but two and its being hard to hit upon the time when they do so, fancy that the animal sheds no teeth at all; others, after observing the shedding of two, come to the conclusion that the creature sheds the rest in due turn. Men discern the age of a dog by inspection of its teeth; with young dogs the teeth are white and sharp pointed, with old dogs black and blunted.

21

The bull impregnates the cow at a single mount, and mounts with such vigour as to weigh down the cow; if his effort be unsuccessful, the cow must be allowed an interval of twenty days before being again submitted. Bulls of mature age decline to mount the same cow several times on one day, except, by the way, at considerable intervals. Young bulls by reason of their vigour are enabled to mount the same cow several times in one day, and a good many cows besides. The bull is the least salacious of male animals.... The victor among the bulls is the one that mounts the females; when he gets exhausted by his amorous efforts, his beaten antagonist sets on him and very often gets the better of the conflict. The bull and the cow are about a year old when it is possible for them to have commerce with chance of offspring: as a rule, however, they are about twenty months old, but it is universally allowed that they are capable in this respect at the age of two years. The cow goes with calf for nine months, and she calves in the tenth month; some maintain that they go in calf for ten months, to the very day. A calf delivered before the times here specified is an

abortion and never lives, however little premature its birth may have been, as its hooves are weak and imperfect. The cow as a rule bears but one calf, very seldom two; she submits to the bull and bears as long as she lives.

Cows live for about fifteen years, and the bulls too, if they have been castrated; but some live for twenty years or even more, if their bodily constitutions be sound. The herdsmen tame the castrated bulls, and give them an office in the herd analogous to the office of the bell-wether in a flock; and these bulls live to an exceptionally advanced age, owing to their exemption from hardship and to their browsing on pasture of good quality. The bull is in fullest vigour when five years old, which leads the critics to commend Homer for applying to the bull the epithets of 'five-year-old', or 'of nine seasons', which epithets are alike in meaning. The ox sheds his teeth at the age of two years, not all together but just as the horse sheds his. When the animal suffers from podagra it does not shed the hoof, but is subject to a painful swelling in the feet. The milk of the cow is serviceable after parturition, and before parturition there is no milk at all. The milk that first presents itself becomes as hard as stone when it clots; this result ensues unless it be previously diluted with water. Oxen younger than a year old do not copulate unless under circumstances of an unnatural and portentous kind: instances have been recorded of copulation in both sexes at the age of four months. Kine in general begin to submit to the male about the month of Thargelion or of Scirophorion; some, however, are capable of conception right on to the autumn. When kine in large numbers receive the bull and conceive, it is looked upon as prognostic of rain and stormy weather. Kine herd together like mares, but in lesser degree.

22

In the case of horses, the stallion and the mare are first fitted for breeding purposes when two years old. Instances, however, of such early maturity are rare, and their young are exceptionally small and weak; the ordinary age for sexual maturity is three years, and from that age to twenty the two sexes go on improving in the quality of their offspring. The mare carries her foal for eleven months, and casts it in the twelfth. It is not a fixed number of days that the stallion takes to impregnate the mare; it may be one, two, three, or more. An ass in covering will impregnate more expeditiously than a stallion. The act of intercourse with horses is not laborious as it is with oxen. In both sexes the horse is the most salacious of animals next after the human species. The breeding faculties of the younger horses may be stimulated beyond their years if they be supplied with good feeding in abundance. The mare as a rule bears only one foal; occasionally she has two, but never more. A mare has been known to cast two mules; but such a circumstance was regarded as unnatural and portentous.

The horse then is first fitted for breeding purposes at the age of two and a half years, but achieves full sexual maturity when it has ceased to shed teeth, except it be naturally infertile; it must be added, however, that some horses have been known to impregnate the mare while the teeth were in process of shedding.

The horse has forty teeth. It sheds its first set of four, two from the upper jaw and two from the lower, when two and a half years old. After a year's interval, it sheds another set of four in like manner, and another set of four after yet another year's interval; after arriving at the age of four years and six months it sheds no more. An instance has occurred where a horse shed all his teeth at once, and another instance of a horse shedding all

his teeth with his last set of four; but such instances are very rare. It consequently happens that a horse when four and a half years old is in excellent condition for breeding purposes.

The older horses, whether of the male or female, are the more generatively productive. Horses will cover mares from which they have been foaled and mares which they have begotten; and, indeed, a troop of horses is only considered perfect when such promiscuity of intercourse occurs. Scythians use pregnant mares for riding when the embryo has turned rather soon in the womb, and they assert that thereby the mothers have all the easier delivery. Quadrupeds as a rule lie down for parturition, and in consequence the young of them all come out of the womb sideways. The mare, however, when the time for parturition arrives, stands erect and in that posture casts its foal.

The horse in general lives for eighteen or twenty years; some horses live for twenty-five or even thirty, and if a horse be treated with extreme care, it may last on to the age of fifty years; a horse, however, when it reaches thirty years is regarded as exceptionally old. The mare lives usually for twenty-five years, though instances have occurred of their attaining the age of forty. The male is less long-lived than the female by reason of the sexual service he is called on to render; and horses that are reared in a private stable live longer than such as are reared in troops. The mare attains her full length and height at five years old, the stallion at six; in another six years the animal reaches its full bulk, and goes on improving until it is twenty years old. The female, then, reaches maturity more rapidly than the male, but in the womb the case is reversed, just as is observed in regard to the sexes of the human species; and the same phenomenon is observed in the case of all animals that bear several young.

The mare is said to suckle a mule-foal for six months, but not to allow its approach for any longer on account of the pain it is put to by the hard tugging of the young; an ordinary foal it allows to suck for a longer period.

Horse and mule are at their best after the shedding of the teeth. After they have shed them all, it is not easy to distinguish their age; hence they are said to carry their mark before the shedding, but not after. However, even after the shedding their age is pretty well recognized by the aid of the canines; for in the case of horses much ridden these teeth are worn away by attrition caused by the insertion of the bit; in the case of horses not ridden the teeth are large and detached, and in young horses they are sharp and small.

The male of the horse will breed at all seasons and during its whole life; the mare can take the horse all its life long, but is not thus ready to pair at all seasons unless it be held in check by a halter or some other compulsion be brought to bear. There is no fixed time at which intercourse of the two sexes cannot take place; and accordingly intercourse may chance to take place at a time that may render difficult the rearing of the future progeny. In a stable in Opus there was a stallion that used to serve mares when forty years old: his fore legs had to be lifted up for the operation.

Mares first take the horse in the spring-time. After a mare has foaled she does not get impregnated at once again, but only after a considerable interval; in fact, the foals will be all the better if the interval extend over four or five years. It is, at all events, absolutely necessary to allow an interval of one year, and for that period to let her lie fallow. A mare, then, breeds at intervals; a she-ass breeds on and on without intermission. Of mares some are absolutely sterile, others are capable of conception but incapable of bringing the foal to full term; it is

said to be an indication of this condition in a mare, that her foal if dissected is found to have other kidney-shaped substances round about its kidneys, presenting the appearance of having four kidneys.

After parturition the mare at once swallows the after-birth, and bites off the growth, called the 'hippomanes', that is found on the forehead of the foal. This growth is somewhat smaller than a dried fig; and in shape is broad and round, and in colour black. If any bystander gets possession of it before the mare, and the mare gets a smell of it, she goes wild and frantic at the smell. And it is for this reason that venders of drugs and simples hold the substance in high request and include it among their stores.

If an ass cover a mare after the mare has been covered by a horse, the ass will destroy the previously formed embryo.

(Horse-trainers do not appoint a horse as leader to a troop, as herdsmen appoint a bull as leader to a herd, and for this reason that the horse is not steady but quick-tempered and skittish.)

23

The ass of both sexes is capable of breeding, and sheds its first teeth at the age of two and a half years; it sheds its second teeth within six months, its third within another six months, and the fourth after the like interval. These fourth teeth are termed the gnomons or age-indicators.

A she-ass has been known to conceive when a year old, and the foal to be reared. After intercourse with the male it will discharge the genital sperm unless it be hindered, and for this reason it is usually beaten after such intercourse and chased

about. It casts its young in the twelfth month. It usually bears but one foal, and that is its natural number, occasionally however it bears twins. The ass if it cover a mare destroys, as has been said, the embryo previously begotten by the horse; but, after the mare has been covered by the ass, the horse supervening will not spoil the embryo. The she-ass has milk in the tenth month of pregnancy. Seven days after casting a foal the she-ass submits to the male, and is almost sure to conceive if put to the male on this particular day; the same result, however, is quite possible later on. The she-ass will refuse to cast her foal with any one looking on or in the daylight and just before foaling she has to be led away into a dark place. If the she-ass has had young before the shedding of the index-teeth, she will bear all her life through; but if not, then she will neither conceive nor bear for the rest of her days. The ass lives for more than thirty years, and the she-ass lives longer than the male.

When there is a cross between a horse and a she-ass or a jackass and a mare, there is much greater chance of a miscarriage than where the commerce is normal. The period for gestation in the case of a cross depends on the male, and is just what it would have been if the male had had commerce with a female of his own kind. In regard to size, looks, and vigour, the foal is more apt to resemble the mother than the sire. If such hybrid connexions be continued without intermittence, the female will soon go sterile; and for this reason trainers always allow of intervals between breeding times. A mare will not take the ass, nor a she ass the horse, unless the ass or she-ass shall have been suckled by a mare; and for this reason trainers put foals of the she-ass under mares, which foals are technically spoken of as 'mare-suckled'. These asses, thus reared, mount the mares in the open pastures, mastering them by force as the stallions do.

24

A mule is fitted for commerce with the female after the first shedding of its teeth, and at the age of seven will impregnate effectually; and where connexion has taken place with a mare, a 'hinny' has been known to be produced. After the seventh year it has no further intercourse with the female. A female mule has been known to be impregnated, but without the impregnation being followed up by parturition. In Syrophoenicia she-mules submit to the mule and bear young; but the breed, though it resembles the ordinary one, is different and specific. The hinny or stunted mule is foaled by a mare when she has gone sick during gestation, and corresponds to the dwarf in the human species and to the after-pig or scut in swine; and as is the case with dwarfs, the sexual organ of the hinny is abnormally large.

The mule lives for a number of years. There are on record cases of mules living to the age of eighty, as did one in Athens at the time of the building of the temple; this mule on account of its age was let go free, but continued to assist in dragging burdens, and would go side by side with the other draught-beasts and stimulate them to their work; and in consequence a public decree was passed forbidding any baker driving the creature away from his bread-tray. The she-mule grows old more slowly than the mule. Some assert that the she-mule menstruates by the act of voiding her urine, and that the mule owes the prematurity of his decay to his habit of smelling at the urine. So much for the modes of generation in connexion with these animals.

25

Breeders and trainers can distinguish between young and old quadrupeds. If, when drawn back from the jaw, the skin at once goes back to its place, the animal is young; if it remains long wrinkled up, the animal is old.

26

The camel carries its young for ten months, and bears but one at a time and never more; the young camel is removed from the mother when a year old. The animal lives for a long period, more than fifty years. It bears in spring-time, and gives milk until the time of the next conception. Its flesh and milk are exceptionally palatable. The milk is drunk mixed with water in the proportion of either two to one or three to one.

27

The elephant of either sex is fitted for breeding before reaching the age of twenty. The female carries her young, according to some accounts, for two and a half years; according to others, for three years; and the discrepancy in the assigned periods is due to the fact that there are never human eyewitnesses to the commerce between the sexes. The female settles down on its rear to cast its young, and obviously suffers greatly during the process. The young one, immediately after birth, sucks the mother, not with its trunk but with the mouth; and can walk about and see distinctly the moment it is born.

28

The wild sow submits to the boar at the beginning of winter, and in the spring-time retreats for parturition to a lair in some district inaccessible to intrusion, hemmed in with sheer cliffs and chasms and overshadowed by trees. The boar usually remains by the sow for thirty days. The number of the litter and the period gestation is the same as in the case of the domesticated congener. The sound of the grunt also is similar; only that the sow grunts continually, and the boar but seldom. Of the wild boars such as are castrated grow to the largest size and become fiercest: to which circumstance Homer alludes when he says:

'He reared against him a wild castrated boar: it was not like a food-devouring brute, but like a forest-clad promontory.'

Wild boars become castrated owing to an itch befalling them in early life in the region of the testicles, and the castration is superinduced by their rubbing themselves against the trunks of trees.

29

The hind, as has been stated, submits to the stag as a rule only under compulsion, as she is unable to endure the male often owing to the rigidity of the penis. However, they do occasionally submit to the stag as the ewe submits ram; and when they are in heat the hinds avoid one another. The stag is not constant to one particular hind, but after a while quits one and mates with

others. The breeding time is after the rising of Arcturus, during the months of Boedromion and Maimacterion. The period of gestation lasts for eight months. Conception comes on a few days after intercourse; and a number of hinds can be impregnated by a single male. The hind, as a rule, bears but one fawn, although instances have been known of her casting two. Out of dread of wild beasts she casts her young by the side of the high-road. The young fawn grows with rapidity. Menstruation occurs at no other time with the hind; it takes place only after parturition, and the substance is phlegm-like.

The hind leads the fawn to her lair; this is her place of refuge, a cave with a single inlet, inside which she shelters herself against attack.

Fabulous stories are told concerning the longevity of the animal, but the stories have never been verified, and the brevity of the period of gestation and the rapidity of growth in the fawn would not lead one to attribute extreme longevity to this creature.

In the mountain called Elaphoeis or Deer Mountain, which is in Arginussa in Asia Minor – the place, by the way, where Alcibiades was assassinated – all the hinds have the ear split, so that, if they stray to a distance, they can be recognized by this mark; and the embryo actually has the mark while yet in the womb of the mother.

The hind has four teats like the cow. After the hinds have become pregnant, the males all segregate one by one, and in consequence of the violence of their sexual passions they keep each one to himself, dig a hole in the ground, and bellow from time to time; in all these particulars they resemble the goat, and their foreheads from getting wetted become black, as is also the case with the goat. In this way they pass the time until the rain falls, after which time they turn to pasture. The animal acts in this way owing to its sexual wantonness and also to its obesity;

for in summer-time it becomes so exceptionally fat as to be unable to run: in fact at this period they can be overtaken by the hunters that pursue them on foot in the second or third run; and, by the way, in consequence of the heat of the weather and their getting out of breath they always make for water in their runs. In the rutting season, the flesh of the deer is unsavoury and rank, like the flesh of the he-goat. In winter-time the deer becomes thin and weak, but towards the approach of the spring he is at his best for running. When on the run the deer keeps pausing from time to time, and waits until his pursuer draws upon him, whereupon he starts off again. This habit appears due to some internal pain: at all events, the gut is so slender and weak that, if you strike the animal ever so softly, it is apt to break asunder, though the hide of the animal remains sound and uninjured.

30

Bears, as has been previously stated, do not copulate with the male mounting the back of the female, but with the female lying down under the male. The she-bear goes with young for thirty days. She brings forth sometimes one cub, sometimes two cubs, and at most five. Of all animals the newly born cub of the she bear is the smallest in proportion to the size of the mother; that is to say, it is larger than a mouse but smaller than a weasel. It is also smooth and blind, and its legs and most of its organs are as yet inarticulate. Pairing takes Place in the month of Elaphebolion, and parturition about the time for retiring into winter quarters; about this time the bear and the she-bear are at the fattest. After the she-bear has reared her young, she comes out of her winter lair in the third month, when it is already spring. The female porcupine, by the way, hibernates

and goes with young the same number of days as the she-bear, and in all respects as to parturition resembles this animal. When a she-bear is with young, it is a very hard task to catch her.

31

It has already been stated that the lion and lioness copulate rearwards, and that these animals are opisthuretic. They do not copulate nor bring forth at all seasons indiscriminately, but once in the year only. The lioness brings forth in the spring, generally two cubs at a time, and six at the very most; but sometimes only one. The story about the lioness discharging her womb in the act of parturition is a pure fable, and was merely invented to account for the scarcity of the animal; for the animal is, as is well known, a rare animal, and is not found in many countries. In fact, in the whole of Europe it is only found in the strip between the rivers Achelous and Nessus. The cubs of the lioness when newly born are exceedingly small, and can scarcely walk when two months old. The Syrian lion bears cubs five times: five cubs at the first litter, then four, then three, then two, and lastly one; after this the lioness ceases to bear for the rest of her days. The lioness has no mane, but this appendage is peculiar to the lion. The lion sheds only the four so-called canines, two in the upper jaw and two in the lower; and it sheds them when it is six months old.

32

The hyena in colour resembles the wolf, but is more shaggy, and is furnished with a mane running all along the spine. What is recounted concerning its genital organs, to the effect that every hyena is furnished with the organ both of the male and the female, is untrue. The fact is that the sexual organ of the male hyena resembles the same organ in the wolf and in the dog; the part resembling the female genital organ lies underneath the tail, and does to some extent resemble the female organ, but it is unprovided with duct or passage, and the passage for the residuum comes underneath it. The female hyena has the part that resembles the organ of the male, and, as in the case of the male, has it underneath her tail, unprovided with duct or passage; and after it the passage for the residuum, and underneath this the true female genital organ. The female hyena has a womb, like all other female animals of the same kind. It is an exceedingly rare circumstance to meet with a female hyena. At least a hunter said that out of eleven hyenas he had caught, only one was a female.

33

Hares copulate in a rearward posture, as has been stated, for the animal is opisthuretic. They breed and bear at all seasons, superfoetate during pregnancy, and bear young every month. They do not give birth to their young ones all together at one time, but bring them forth at intervals over as many days as the circumstances of each case may require. The female is supplied with milk before parturition; and after bearing submits immediately to the male, and is capable of conception while suckling her young. The milk in consistency resembles sow's

milk. The young are born blind, as is the case with the greater part Of the fissipeds or toed animals.

34

The fox mounts the vixen in copulation, and the vixen bears young like the she-bear; in fact, her young ones are even more inarticulately formed. Before parturition she retires to sequestered places, so that it is a great rarity for a vixen to be caught while pregnant. After parturition she warms her young and gets them into shape by licking them. She bears four at most at a birth.

35

The wolf resembles the dog in regard to the time of conception and parturition, the number of the litter, and the blindness of the newborn young. The sexes couple at one special period, and the female brings forth at the beginning of the summer. There is an account given of the parturition of the she-wolf that borders on the fabulous, to the effect that she confines her lying-in to within twelve particular days of the year. And they give the reason for this in the form of a myth, viz. that when they transported Leto in so many days from the land of the Hyperboreans to the island of Delos, she assumed the form of a she-wolf to escape the anger of Here. Whether the account be correct or not has not yet been verified; I give it merely as it is currently told. There is no more of truth in the current

statement that the she-wolf bears once and only once in her lifetime.

The cat and the ichneumon bear as many young as the dog, and live on the same food; they live about six years. The cubs of the panther are born blind like those of the wolf, and the female bears four at the most at one birth. The particulars of conception are the same for the thos, or civet, as for the dog; the cubs of the animal are born blind, and the female bears two, or three, or four at a birth. It is long in the body and low in stature; but not withstanding the shortness of its legs it is exceptionally fleet of foot, owing to the suppleness of its frame and its capacity for leaping.

36

There is found in Syria a so-called mule. It is not the same as the cross between the horse and ass, but resembles it just as a wild ass resembles the domesticated congener, and derives its name from the resemblance. Like the wild ass, this wild mule is remarkable for its speed. The animals of this species interbreed with one another; and a proof of this statement may be gathered from the fact that a certain number of them were brought into Phrygia in the time of Pharnaces, the father of Pharnabazus, and the animal is there still. The number originally introduced was nine, and there are three there at the present day.

37

The phenomena of generation in regard to the mouse are the most astonishing both for the number of the young and for the rapidity of recurrence in the births. On one occasion a she-mouse in a state of pregnancy was shut up by accident in a jar containing millet-seed, and after a little while the lid of the jar was removed and upwards of one hundred and twenty mice were found inside it.

The rate of propagation of field mice in country places, and the destruction that they cause, are beyond all telling. In many places their number is so incalculable that but very little of the corn-crop is left to the farmer; and so rapid is their mode of proceeding that sometimes a small farmer will one day observe that it is time for reaping, and on the following morning, when he takes his reapers afield, he finds his entire crop devoured. Their disappearance is unaccountable: in a few days not a mouse will there be to be seen. And yet in the time before these few days men fail to keep down their numbers by fumigating and unearthing them, or by regularly hunting them and turning in swine upon them; for pigs, by the way, turn up the mouse-holes by rooting with their snouts. Foxes also hunt them, and the wild ferrets in particular destroy them, but they make no way against the prolific qualities of the animal and the rapidity of its breeding. When they are super-abundant, nothing succeeds in thinning them down except the rain; but after heavy rains they disappear rapidly.

In a certain district of Persia when a female mouse is dissected the female embryos appear to be pregnant. Some people assert, and positively assert, that a female mouse by licking salt can become pregnant without the intervention of the male.

Mice in Egypt are covered with bristles like the hedgehog. There is also a different breed of mice that walk on their two hind-

legs; their front legs are small and their hind-legs long; the breed is exceedingly numerous. There are many other breeds of mice than are here referred to.

Book VII

1

As to Man's growth, first within his mother's womb and afterward to old age, the course of nature, in so far as man is specially concerned, is after the following manner. And, by the way, the difference of male and female and of their respective organs has been dealt with heretofore. When twice seven years old, in the most of cases, the male begins to engender seed; and at the same time hair appears upon the pubes, in like manner, so Alcmaeon of Croton remarks, as plants first blossom and then seed. About the same time, the voice begins to alter, getting harsher and more uneven, neither shrill as formerly nor deep as afterward, nor yet of any even tone, but like an instrument whose strings are frayed and out of tune; and it is called, by way of by-word, the bleat of the billy-goat. Now this breaking of the voice is the more apparent in those who are making trial of their sexual powers; for in those who are prone to lustfulness the voice turns into the voice of a man, but not so in the continent. For if a lad strive diligently to hinder his voice from breaking, as some do of those who devote themselves to music, the voice lasts a long while unbroken and may even

persist with little change. And the breasts swell and likewise the private parts, altering in size and shape. (And by the way, at this time of life those who try by friction to provoke emission of seed are apt to experience pain as well as voluptuous sensations.) At the same age in the female, the breasts swell and the so-called catamenia commence to flow; and this fluid resembles fresh blood. There is another discharge, a white one, by the way, which occurs in girls even at a very early age, more especially if their diet be largely of a fluid nature; and this malady causes arrest of growth and loss of flesh. In the majority of cases the catamenia are noticed by the time the breasts have grown to the height of two fingers' breadth. In girls, too, about this time the voice changes to a deeper note; for while in general the woman's voice is higher than the man's, so also the voices of girls are pitched in a higher key than the elder women's, just as the boy's are higher than the men's; and the girls' voices are shriller than the boys', and a maid's flute is tuned sharper than a lad's.

Girls of this age have much need of surveillance. For then in particular they feel a natural impulse to make usage of the sexual faculties that are developing in them; so that unless they guard against any further impulse beyond that inevitable one which their bodily development of itself supplies, even in the case of those who abstain altogether from passionate indulgence, they contract habits which are apt to continue into later life. For girls who give way to wantonness grow more and more wanton; and the same is true of boys, unless they be safeguarded from one temptation and another; for the passages become dilated and set up a local flux or running, and besides this the recollection of pleasure associated with former indulgence creates a longing for its repetition.

Some men are congenitally impotent owing to structural defect; and in like manner women also may suffer from congenital

incapacity. Both men and women are liable to constitutional change, growing healthier or more sickly, or altering in the way of leanness, stoutness, and vigour; thus, after puberty some lads who were thin before grow stout and healthy, and the converse also happens; and the same is equally true of girls. For when in boy or girl the body is loaded with superfluous matter, then, when such superfluities are got rid of in the spermatic or catamenial discharge, their bodies improve in health and condition owing to the removal of what had acted as an impediment to health and proper nutrition; but in such as are of opposite habit their bodies become emaciated and out of health, for then the spermatic discharge in the one case and the catamenial flow in the other take place at the cost of natural healthy conditions.

Furthermore, in the case of maidens the condition of the breasts is diverse in different individuals, for they are sometimes quite big and sometimes little; and as a general rule their size depends on whether or not the body was burthened in childhood with superfluous material. For when the signs of womanhood are nigh but not come, the more there be of moisture the more will it cause the breasts to swell, even to the bursting point; and the result is that the breasts remain during after-life of the bulk that they then acquired. And among men, the breasts grow more conspicuous and more like to those of women, both in young men and old, when the individual temperament is moist and sleek and the reverse of sinewy, and all the more among the dark-complexioned than the fair.

At the outset and till the age of one and twenty the spermatic discharge is devoid of fecundity; afterwards it becomes fertile, but young men and women produce undersized and imperfect progeny, as is the case also with the common run of animals. Young women conceive readily, but, having conceived, their labour in childbed is apt to be difficult.

The frame fails of reaching its full development and ages quickly in men of intemperate lusts and in women who become mothers of many children; for it appears to be the case that growth ceases when the woman has given birth to three children. Women of a lascivious disposition grow more sedate and virtuous after they have borne several children.

After the age of twenty-one women are fully ripe for child-bearing, but men go on increasing in vigour. When the spermatic fluid is of a thin consistency it is infertile; when granular it is fertile and likely to produce male children, but when thin and unclotted it is apt to produce female offspring. And it is about this time of life that in men the beard makes its appearance.

2

The onset of the catamenia in women takes place towards the end of the month; and on this account the wiseacres assert that the moon is feminine, because the discharge in women and the waning of the moon happen at one and the same time, and after the wane and the discharge both one and the other grow whole again. (In some women the catamenia occur regularly but sparsely every month, and more abundantly every third month.) With those in whom the ailment lasts but a little while, two days or three, recovery is easy; but where the duration is longer, the ailment is more troublesome. For women are ailing during these days; and sometimes the discharge is sudden and sometimes gradual, but in all cases alike there is bodily distress until the attack be over. In many cases at the commencement of the attack, when the discharge is about to appear, there occur

spasms and rumbling noises within the womb until such time as the discharge manifests itself.

Under natural conditions it is after recovery from these symptoms that conception takes place in women, and women in whom the signs do not manifest themselves for the most part remain childless. But the rule is not without exception, for some conceive in spite of the absence of these symptoms; and these are cases in which a secretion accumulates, not in such a way as actually to issue forth, but in amount equal to the residuum left in the case of child-bearing women after the normal discharge has taken place. And some conceive while the signs are on but not afterwards, those namely in whom the womb closes up immediately after the discharge. In some cases the menses persist during pregnancy up to the very last; but the result in these cases is that the offspring are poor, and either fail to survive or grow up weakly.

In many cases, owing to excessive desire, arising either from youthful impetuosity or from lengthened abstinence, prolapsion of the womb takes place and the catamenia appear repeatedly, thrice in the month, until conception occurs; and then the womb withdraws upwards again to its proper place...

As we have remarked above, the discharge is wont to be more abundant in women than in the females of any other animals. In creatures that do not bring forth their young alive nothing of the sort manifests itself, this particular superfluity being converted into bodily substance; and by the way, in such animals the females are sometimes larger than the males; and moreover, the material is used up sometimes for scutes and sometimes for scales, and sometimes for the abundant covering of feathers, whereas in the vivipara possessed of limbs it is turned into hair and into bodily substance (for man alone among them is smooth-skinned), and into urine, for this

excretion is in the majority of such animals thick and copious. Only in the case of women is the superfluity turned into a discharge instead of being utilized in these other ways.

There is something similar to be remarked of men: for in proportion to his size man emits more seminal fluid than any other animal (for which reason man is the smoothest of animals), especially such men as are of a moist habit and not over corpulent, and fair men in greater degree than dark. It is likewise with women; for in the stout, great part of the excretion goes to nourish the body. In the act of intercourse, women of a fair complexion discharge a more plentiful secretion than the dark; and furthermore, a watery and pungent diet conduces to this phenomenon.

3

It is a sign of conception in women when the place is dry immediately after intercourse. If the lips of the orifice be smooth conception is difficult, for the matter slips off; and if they be thick it is also difficult. But if on digital examination the lips feel somewhat rough and adherent, and if they be likewise thin, then the chances are in favour of conception. Accordingly, if conception be desired, we must bring the parts into such a condition as we have just described; but if on the contrary we want to avoid conception then we must bring about a contrary disposition. Wherefore, since if the parts be smooth conception is prevented, some anoint that part of the womb on which the seed falls with oil of cedar, or with ointment of lead or with frankincense, commingled with olive oil. If the seed remain within for seven days then it is certain that conception has

taken place; for it is during that period that what is known as effluxion takes place.

In most cases the menstrual discharge recurs for some time after conception has taken place, its duration being mostly thirty days in the case of a female and about forty days in the case of a male child. After parturition also it is common for the discharge to be withheld for an equal number of days, but not in all cases with equal exactitude. After conception, and when the above-mentioned days are past, the discharge no longer takes its natural course but finds its way to the breasts and turns to milk. The first appearance of milk in the breasts is scant in quantity and so to speak cobwebby or interspersed with little threads. And when conception has taken place, there is apt to be a sort of feeling in the region of the flanks, which in some cases quickly swell up a little, especially in thin persons, and also in the groin.

In the case of male children the first movement usually occurs on the right-hand side of the womb and about the fortieth day, but if the child be a female then on the left-hand side and about the ninetieth day. However, we must by no means assume this to be an accurate statement of fact, for there are many exceptions, in which the movement is manifested on the right-hand side though a female child be coming, and on the left-hand side though the infant be a male. And in short, these and all suchlike phenomena are usually subject to differences that may be summed up as differences of degree.

About this period the embryo begins to resolve into distinct parts, it having hitherto consisted of a fleshlike substance without distinction of parts.

What is called effluxion is a destruction of the embryo within the first week, while abortion occurs up to the fortieth day; and

the greater number of such embryos as perish do so within the space of these forty days.

In the case of a male embryo aborted at the fortieth day, if it be placed in cold water it holds together in a sort of membrane, but if it be placed in any other fluid it dissolves and disappears. If the membrane be pulled to bits the embryo is revealed, as big as one of the large kind of ants; and all the limbs are plain to see, including the penis, and the eyes also, which as in other animals are of great size. But the female embryo, if it suffer abortion during the first three months, is as a rule found to be undifferentiated; if however it reach the fourth month it comes to be subdivided and quickly attains further differentiation. In short, while within the womb, the female infant accomplishes the whole development of its parts more slowly than the male, and more frequently than the man-child takes ten months to come to perfection. But after birth, the females pass more quickly than the males through youth and maturity and age; and this is especially true of those that bear many children, as indeed I have already said.

4

When the womb has conceived the seed, straightway in the majority of cases it closes up until seven months are fulfilled; but in the eighth month it opens, and the embryo, if it be fertile, descends in the eighth month. But such embryos as are not fertile but are devoid of breath at eight months old, their mothers do not bring into the world by parturition at eight months, neither does the embryo descend within the womb at that period nor does the womb open. And it is a sign that the

embryo is not capable of life if it be formed without the above-named circumstances taking place.

After conception women are prone to a feeling of heaviness in all parts of their bodies, and for instance they experience a sensation of darkness in front of the eyes and suffer also from headache. These symptoms appear sooner or later, sometimes as early as the tenth day, according as the patient be more or less burthened with superfluous humours. Nausea also and sickness affect the most of women, and especially such as those that we have just now mentioned, after the menstrual discharge has ceased and before it is yet turned in the direction of the breasts.

Moreover, some women suffer most at the beginning of their pregnancy and some at a later period when the embryo has had time to grow; and in some women it is a common occurrence to suffer from strangury towards the end of their time. As a general rule women who are pregnant of a male child escape comparatively easily and retain a comparatively healthy look, but it is otherwise with those whose infant is a female; for these latter look as a rule paler and suffer more pain, and in many cases they are subject to swellings of the legs and eruptions on the body. Nevertheless the rule is subject to exceptions.

Women in pregnancy are a prey to all sorts of longings and to rapid changes of mood, and some folks call this the ‘ivy-sickness’; and with the mothers of female infants the longings are more acute, and they are less contented when they have got what they desired.

In a certain few cases the patient feels unusually well during pregnancy. The worst time of all is just when the child’s hair is beginning to grow.

In pregnant women their own natural hair is inclined to grow thin and fall out, but on the other hand hair tends to grow on parts of the body where it was not wont to be. As a general rule, a man-child is more prone to movement within its mother's womb than a female child, and it is usually born sooner. And labour in the case of female children is apt to be protracted and sluggish, while in the case of male children it is acute and by a long way more difficult. Women who have connexion with their husbands shortly before childbirth are delivered all the more quickly. Occasionally women seem to be in the pains of labour though labour has not in fact commenced, what seemed like the commencement of labour being really the result of the foetus turning its head.

Now all other animals bring the time of pregnancy to an end in a uniform way; in other words, one single term of pregnancy is defined for each of them. But in the case of mankind alone of all animals the times are diverse; for pregnancy may be of seven months' duration, or of eight months or of nine, and still more commonly of ten months, while some few women go even into the eleventh month.

Children that come into the world before seven months can under no circumstances survive. The seven-months' children are the earliest that are capable of life, and most of them are weakly – for which reason, by the way, it is customary to swaddle them in wool, – and many of them are born with some of the orifices of the body imperforate, for instance the ears or the nostrils. But as they get bigger they become more perfectly developed, and many of them grow up.

In Egypt, and in some other places where the women are fruitful and are wont to bear and bring forth many children without difficulty, and where the children when born are capable of living even if they be born subject to deformity, in

these places the eight-months' children live and are brought up, but in Greece it is only a few of them that survive while most perish. And this being the general experience, when such a child does happen to survive the mother is apt to think that it was not an eight months' child after all, but that she had conceived at an earlier period without being aware of it.

Women suffer most pain about the fourth and the eighth months, and if the foetus perishes in the fourth or in the eighth month the mother also succumbs as a general rule; so that not only do the eight-months' children not live, but when they die their mothers are in great danger of their own lives. In like manner children that are apparently born at a later term than eleven months are held to be in doubtful case; inasmuch as with them also the beginning of conception may have escaped the notice of the mother. What I mean to say is that often the womb gets filled with wind, and then when at a later period connexion and conception take place, they think that the former circumstance was the beginning of conception from the similarity of the symptoms that they experienced.

Such then are the differences between mankind and other animals in regard to the many various modes of completion of the term of pregnancy. Furthermore, some animals produce one and some produce many at a birth, but the human species does sometimes the one and sometimes the other. As a general rule and among most nations the women bear one child a birth; but frequently and in many lands they bear twins, as for instance in Egypt especially. Sometimes women bring forth three and even four children, and especially in certain parts of the world, as has already been stated. The largest number ever brought forth is five, and such an occurrence has been witnessed on several occasions. There was once upon a time a certain women who had twenty children at four births; each time she had five, and most of them grew up.

Now among other animals, if a pair of twins happen to be male and female they have as good a chance of surviving as though both had been males or both females; but among mankind very few twins survive if one happen to be a boy and the other a girl.

Of all animals the woman and the mare are most inclined to receive the commerce of the male during pregnancy; while all other animals when they are pregnant avoid the male, save those in which the phenomenon of superfoetation occurs, such as the hare. Unlike that animal, the mare after once conceiving cannot be rendered pregnant again, but brings forth one foal only, at least as a general rule; in the human species cases of superfoetation are rare, but they do happen now and then.

An embryo conceived some considerable time after a previous conception does not come to perfection, but gives rise to pain and causes the destruction of the earlier embryo; and, by the way, a case has been known to occur where owing to this destructive influence no less than twelve embryos conceived by superfoetation have been discharged. But if the second conception take place at a short interval, then the mother bears that which was later conceived, and brings forth the two children like actual twins, as happened, according to the legend, in the case of Iphicles and Hercules. The following also is a striking example: a certain woman, having committed adultery, brought forth the one child resembling her husband and the other resembling the adulterous lover.

The case has also occurred where a woman, being pregnant of twins, has subsequently conceived a third child; and in course of time she brought forth the twins perfect and at full term, but the third a five-months' child; and this last died there and then. And in another case it happened that the woman was first delivered of a seven-months' child, and then of two which were

of full term; and of these the first died and the other two survived.

Some also have been known to conceive while about to miscarry, and they have lost the one child and been delivered of the other.

If women while going with child cohabit after the eighth month the child is in most cases born covered over with a slimy fluid. Often also the child is found to be replete with food of which the mother had partaken.

5

When women have partaken of salt in overabundance their children are apt to be born destitute of nails.

Milk that is produced earlier than the seventh month is unfit for use; but as soon as the child is fit to live the milk is fit to use. The first of the milk is saltish, as it is likewise with sheep. Most women are sensibly affected by wine during pregnancy, for if they partake of it they grow relaxed and debilitated.

The beginning of child-bearing in women and of the capacity to procreate in men, and the cessation of these functions in both cases, coincide in the one case with the emission of seed and in the other with the discharge of the catamenia: with this qualification that there is a lack of fertility at the commencement of these symptoms, and again towards their close when the emissions become scanty and weak. The age at which the sexual powers begin has been related already. As for their end, the menstrual discharges ceases in most women about their fortieth year; but with those in whom it goes on

longer it lasts even to the fiftieth year, and women of that age have been known to bear children. But beyond that age there is no case on record.

6

Men in most cases continue to be sexually competent until they are sixty years old, and if that limit be overpassed then until seventy years; and men have been actually known to procreate children at seventy years of age. With many men and many women it so happens that they are unable to produce children to one another, while they are able to do so in union with other individuals. The same thing happens with regard to the production of male and female offspring; for sometimes men and women in union with one another produce male children or female, as the case may be, but children of the opposite sex when otherwise mated. And they are apt to change in this respect with advancing age: for sometimes a husband and wife while they are young produce female children and in later life male children; and in other cases the very contrary occurs. And just the same thing is true in regard to the generative faculty: for some while young are childless, but have children when they grow older; and some have children to begin with, and later on no more.

There are certain women who conceive with difficulty, but if they do conceive, bring the child to maturity; while others again conceive readily, but are unable to bring the child to birth. Furthermore, some men and some women produce female offspring and some male, as for instance in the story of Hercules, who among all his two and seventy children is said to have begotten but one girl. Those women who are unable to

conceive, save with the help of medical treatment or some other adventitious circumstance, are as a general rule apt to bear female children rather than male.

It is a common thing with men to be at first sexually competent and afterwards impotent, and then again to revert to their former powers.

From deformed parents come deformed children, lame from lame and blind from blind, and, speaking generally, children often inherit anything that is peculiar in their parents and are born with similar marks, such as pimples or scars. Such things have been known to be handed down through three generations; for instance, a certain man had a mark on his arm which his son did not possess, but his grandson had it in the same spot though not very distinct.

Such cases, however, are few; for the children of cripples are mostly sound, and there is no hard and fast rule regarding them. While children mostly resemble their parents or their ancestors, it sometimes happens that no such resemblance is to be traced. But parents may pass on resemblance after several generations, as in the case of the woman in Elis, who committed adultery with a negro; in this case it was not the woman's own daughter but the daughter's child that was a blackamoor.

As a rule the daughters have a tendency to take after the mother, and the boys after the father; but sometimes it is the other way, the boys taking after the mother and the girls after the father. And they may resemble both parents in particular features.

There have been known cases of twins that had no resemblance to one another, but they are alike as a general rule. There was once upon a time a woman who had intercourse with her

husband a week after giving birth to a child and she conceived and bore a second child as like the first as any twin. Some women have a tendency to produce children that take after themselves, and others children that take after the husband; and this latter case is like that of the celebrated mare in Pharsalus, that got the name of the Honest Wife.

7

In the emission of sperm there is a preliminary discharge of air, and the outflow is manifestly caused by a blast of air; for nothing is cast to a distance save by pneumatic pressure. After the seed reaches the womb and remains there for a while, a membrane forms around it; for when it happens to escape before it is distinctly formed, it looks like an egg enveloped in its membrane after removal of the eggshell; and the membrane is full of veins.

All animals whatsoever, whether they fly or swim or walk upon dry land, whether they bring forth their young alive or in the egg, develop in the same way: save only that some have the navel attached to the womb, namely the viviparous animals, and some have it attached to the egg, and some to both parts alike, as in a certain sort of fishes. And in some cases membranous envelopes surround the egg, and in other cases the chorion surrounds it. And first of all the animal develops within the innermost envelope, and then another membrane appears around the former one, which latter is for the most part attached to the womb, but is in part separated from it and contains fluid. In between is a watery or sanguineous fluid, which the women folk call the forewaters.

8

All animals, or all such as have a navel, grow by the navel. And the navel is attached to the cotyledon in all such as possess cotyledons, and to the womb itself by a vein in all such as have the womb smooth. And as regards their shape within the womb, the four-footed animals all lie stretched out, and the footless animals lie on their sides, as for instance fishes; but two-legged animals lie in a bent position, as for instance birds; and human embryos lie bent, with nose between the knees and eyes upon the knees, and the ears free at the sides.

All animals alike have the head upwards to begin with; but as they grow and approach the term of egress from the womb they turn downwards, and birth in the natural course of things takes place in all animals head foremost; but in abnormal cases it may take place in a bent position, or feet foremost.

The young of quadrupeds when they are near their full time contain excrements, both liquid and in the form of solid lumps, the latter in the lower part of the bowel and the urine in the bladder.

In those animals that have cotyledons in the womb the cotyledons grow less as the embryo grows bigger, and at length they disappear altogether. The navel-string is a sheath wrapped about blood-vessels which have their origin in the womb, from the cotyledons in those animals which possess them and from a blood-vessel in those which do not. In the larger animals, such as the embryos of oxen, the vessels are four in number, and in smaller animals two; in the very little ones, such as fowls, one vessel only.

Of the four vessels that run into the embryo, two pass through the liver where the so-called gates or 'portae' are, running in the

direction of the great vein, and the other two run in the direction of the aorta towards the point where it divides and becomes two vessels instead of one. Around each pair of blood-vessels are membranes, and surrounding these membranes is the navel-string itself, after the manner of a sheath. And as the embryo grows, the veins themselves tend more and more to dwindle in size. And also as the embryo matures it comes down into the hollow of the womb and is observed to move here, and sometimes rolls over in the vicinity of the groin.

9

When women are in labour, their pains determine towards many divers parts of the body, and in most cases to one or other of the thighs. Those are the quickest to be delivered who experience severe pains in the region of the belly; and parturition is difficult in those who begin by suffering pain in the loins, and speedy when the pain is abdominal. If the child about to be born be a male, the preliminary flood is watery and pale in colour, but if a girl it is tinged with blood, though still watery. In some cases of labour these latter phenomena do not occur, either one way or the other.

In other animals parturition is unaccompanied by pain, and the dam is plainly seen to suffer but moderate inconvenience. In women, however, the pains are more severe, and this is especially the case in persons of sedentary habits, and in those who are weak-chested and short of breath. Labour is apt to be especially difficult if during the process the woman while exerting force with her breath fails to hold it in.

First of all, when the embryo starts to move and the membranes burst, there issues forth the watery flood; then afterwards

comes the embryo, while the womb everts and the afterbirth comes out from within.

10

The cutting of the navel-string, which is the nurse's duty, is a matter calling for no little care and skill. For not only in cases of difficult labour must she be able to render assistance with skilful hand, but she must also have her wits about her in all contingencies, and especially in the operation of tying the cord. For if the afterbirth have come away, the navel is ligatured off from the afterbirth with a woollen thread and is then cut above the ligature; and at the place where it has been tied it heals up, and the remaining portion drops off. (If the ligature come loose the child dies from loss of blood.) But if the afterbirth has not yet come away, but remains after the child itself is extruded, it is cut away within after the ligaturing of the cord.

It often happens that the child appears to have been born dead when it is merely weak, and when before the umbilical cord has been ligatured, the blood has run out into the cord and its surroundings. But experienced midwives have been known to squeeze back the blood into the child's body from the cord, and immediately the child that a moment before was bloodless came back to life again.

It is the natural rule, as we have mentioned above, for all animals to come into the world head foremost, and children, moreover, have their hands stretched out by their sides. And the child gives a cry and puts its hands up to its mouth as soon as it issues forth.

Moreover the child voids excrement sometimes at once, sometimes a little later, but in all cases during the first day; and this excrement is unduly copious in comparison with the size of the child; it is what the midwives call the meconium or 'poppy-juice'. In colour it resembles blood, extremely dark and pitch-like, but later on it becomes milky, for the child takes at once to the breast. Before birth the child makes no sound, even though in difficult labour it put forth its head while the rest of the body remains within.

In cases where flooding takes place rather before its time, it is apt to be followed by difficult parturition. But if discharge take place after birth in small quantity, and in cases where it only takes place at the beginning and does not continue till the fortieth day, then in such cases women make a better recovery and are the sooner ready to conceive again.

Until the child is forty days old it neither laughs nor weeps during waking hours, but of nights it sometimes does both; and for the most part it does not even notice being tickled, but passes most of its time in sleep. As it keeps on growing, it gets more and more wakeful; and moreover it shows signs of dreaming, though it is long afterwards before it remembers what it dreams.

In other animals there is no contrasting difference between one bone and another, but all are properly formed; but in children the front part of the head is soft and late of ossifying. And by the way, some animals are born with teeth, but children begin to cut their teeth in the seventh month; and the front teeth are the first to come through, sometimes the upper and sometimes the lower ones. And the warmer the nurses' milk so much the quicker are the children's teeth to come.

11

After parturition and the cleasing flood the milk comes in plenty, and in some women it flows not only from the nipples but at divers parts of the breasts, and in some cases even from the armpits. And for some time afterwards there continue to be certain indurated parts of the breast called strangalides, or 'knots', which occur when it so happens that the moisture is not concocted, or when it finds no outlet but accumulates within. For the whole breast is so spongy that if a woman in drinking happen to swallow a hair, she gets a pain in her breast, which ailment is called 'trichia'; and the pain lasts till the hair either find its own way out or be sucked out with the milk. Women continue to have milk until their next conception; and then the milk stops coming and goes dry, alike in the human species and in the quadrupedal vivipara. So long as there is a flow of milk the menstrual purgations do not take place, at least as a general rule, though the discharge has been known to occur during the period of suckling. For, speaking generally, a determination of moisture does not take place at one and the same time in several directions; as for instance the menstrual purgations tend to be scanty in persons suffering from haemorrhoids. And in some women the like happens owing to their suffering from varices, when the fluids issue from the pelvic region before entering into the womb. And patients who during suppression of the menses happen to vomit blood are no whit the worse.

12

Children are very commonly subject to convulsions, more especially such of them as are more than ordinarily well-nourished on rich or unusually plentiful milk from a stout nurse. Wine is bad for infants, in that it tends to excite this malady, and red wine is worse than white, especially when taken undiluted; and most things that tend to induce flatulency are also bad, and constipation too is prejudicial. The majority of deaths in infancy occur before the child is a week old, hence it is customary to name the child at that age, from a belief that it has now a better chance of survival. This malady is worst at the full of the moon; and by the way, it is a dangerous symptom when the spasms begin in the child's back.

Book VIII

1

We have now discussed the physical characteristics of animals and their methods of generation. Their habits and their modes of living vary according to their character and their food.

In the great majority of animals there are traces of psychical qualities or attitudes, which qualities are more markedly differentiated in the case of human beings. For just as we pointed out resemblances in the physical organs, so in a number of animals we observe gentleness or fierceness,

mildness or cross temper, courage, or timidity, fear or confidence, high spirit or low cunning, and, with regard to intelligence, something equivalent to sagacity. Some of these qualities in man, as compared with the corresponding qualities in animals, differ only quantitatively: that is to say, a man has more or less of this quality, and an animal has more or less of some other; other qualities in man are represented by analogous and not identical qualities: for instance, just as in man we find knowledge, wisdom, and sagacity, so in certain animals there exists some other natural potentiality akin to these. The truth of this statement will be the more clearly apprehended if we have regard to the phenomena of childhood: for in children may be observed the traces and seeds of what will one day be settled psychological habits, though psychologically a child hardly differs for the time being from an animal; so that one is quite justified in saying that, as regards man and animals, certain psychical qualities are identical with one another, whilst others resemble, and others are analogous to, each other.

Nature proceeds little by little from things lifeless to animal life in such a way that it is impossible to determine the exact line of demarcation, nor on which side thereof an intermediate form should lie. Thus, next after lifeless things in the upward scale comes the plant, and of plants one will differ from another as to its amount of apparent vitality; and, in a word, the whole genus of plants, whilst it is devoid of life as compared with an animal, is endowed with life as compared with other corporeal entities. Indeed, as we just remarked, there is observed in plants a continuous scale of ascent towards the animal. So, in the sea, there are certain objects concerning which one would be at a loss to determine whether they be animal or vegetable. For instance, certain of these objects are fairly rooted, and in several cases perish if detached; thus the pinna is rooted to a particular spot, and the solen (or razor-shell) cannot survive withdrawal

from its burrow. Indeed, broadly speaking, the entire genus of testaceans have a resemblance to vegetables, if they be contrasted with such animals as are capable of progression.

In regard to sensibility, some animals give no indication whatsoever of it, whilst others indicate it but indistinctly. Further, the substance of some of these intermediate creatures is fleshlike, as is the case with the so-called tethya (or ascidians) and the acalephae (or sea-anemones); but the sponge is in every respect like a vegetable. And so throughout the entire animal scale there is a graduated differentiation in amount of vitality and in capacity for motion.

A similar statement holds good with regard to habits of life. Thus of plants that spring from seed the one function seems to be the reproduction of their own particular species, and the sphere of action with certain animals is similarly limited. The faculty of reproduction, then, is common to all alike. If sensibility be superadded, then their lives will differ from one another in respect to sexual intercourse through the varying amount of pleasure derived therefrom, and also in regard to modes of parturition and ways of rearing their young. Some animals, like plants, simply procreate their own species at definite seasons; other animals busy themselves also in procuring food for their young, and after they are reared quit them and have no further dealings with them; other animals are more intelligent and endowed with memory, and they live with their offspring for a longer period and on a more social footing.

The life of animals, then, may be divided into two acts – procreation and feeding; for on these two acts all their interests and life concentrate. Their food depends chiefly on the substance of which they are severally constituted; for the source of their growth in all cases will be this substance. And

whatsoever is in conformity with nature is pleasant, and all animals pursue pleasure in keeping with their nature.

2

Animals are also differentiated locally: that is to say, some live upon dry land, while others live in the water. And this differentiation may be interpreted in two different ways. Thus, some animals are termed terrestrial as inhaling air, and others aquatic as taking in water; and there are others which do not actually take in these elements, but nevertheless are constitutionally adapted to the cooling influence, so far as is needful to them, of one element or the other, and hence are called terrestrial or aquatic though they neither breathe air nor take in water. Again, other animals are so called from their finding their food and fixing their habitat on land or in water: for many animals, although they inhale air and breed on land, yet derive their food from the water, and live in water for the greater part of their lives; and these are the only animals to which as living in and on two elements the term 'amphibious' is applicable. There is no animal taking in water that is terrestrial or aerial or that derives its food from the land, whereas of the great number of land animals inhaling air many get their food from the water; moreover some are so peculiarly organized that if they be shut off altogether from the water they cannot possibly live, as for instance, the so-called sea-turtle, the crocodile, the hippopotamus, the seal, and some of the smaller creatures, such as the fresh-water tortoise and the frog: now all these animals choke or drown if they do not from time to time breathe atmospheric air: they breed and rear their young on dry land, or near the land, but they pass their lives in water.

But the dolphin is equipped in the most remarkable way of all animals: the dolphin and other similar aquatic animals, including the other cetaceans which resemble it; that is to say, the whale, and all the other creatures that are furnished with a blow-hole. One can hardly allow that such an animal is terrestrial and terrestrial only, or aquatic and aquatic only, if by terrestrial we mean an animal that inhales air, and if by aquatic we mean an animal that takes in water. For the fact is the dolphin performs both these processes: he takes in water and discharges it by his blow-hole, and he also inhales air into his lungs; for, by the way, the creature is furnished with this organ and respires thereby, and accordingly, when caught in the nets, he is quickly suffocated for lack of air. He can also live for a considerable while out of the water, but all this while he keeps up a dull moaning sound corresponding to the noise made by air-breathing animals in general; furthermore, when sleeping, the animal keeps his nose above water, and he does so that he may breathe the air. Now it would be unreasonable to assign one and the same class of animals to both categories, terrestrial and aquatic, seeing that these categories are more or less exclusive of one another; we must accordingly supplement our definition of the term 'aquatic' or 'marine'. For the fact is, some aquatic animals take in water and discharge it again, for the same reason that leads air-breathing animals to inhale air: in other words, with the object of cooling the blood. Others take in water as incidental to their mode of feeding; for as they get their food in the water they cannot but take in water along with their food, and if they take in water they must be provided with some organ for discharging it. Those blooded animals, then, that use water for a purpose analogous to respiration are provided with gills; and such as take in water when catching their prey, with the blow-hole. Similar remarks are applicable to molluscs and crustaceans; for again it is by way of procuring food that these creatures take in water.

Aquatic in different ways, the differences depending on bodily relation to external temperature and on habit of life, are such animals on the one hand as take in air but live in water, and such on the other hand as take in water and are furnished with gills but go upon dry land and get their living there. At present only one animal of the latter kind is known, the so-called cordylus or water-newt; this creature is furnished not with lungs but with gills, but for all that it is a quadruped and fitted for walking on dry land.

In the case of all these animals their nature appears in some kind of a way to have got warped, just as some male animals get to resemble the female, and some female animals the male. The fact is that animals, if they be subjected to a modification in minute organs, are liable to immense modifications in their general configuration. This phenomenon may be observed in the case of gelded animals: only a minute organ of the animal is mutilated, and the creature passes from the male to the female form. We may infer, then, that if in the primary conformation of the embryo an infinitesimally minute but absolutely essential organ sustain a change of magnitude one way or the other, the animal will in one case turn to male and in the other to female; and also that, if the said organ be obliterated altogether, the animal will be of neither one sex nor the other. And so by the occurrence of modification in minute organs it comes to pass that one animal is terrestrial and another aquatic, in both senses of these terms. And, again, some animals are amphibious whilst other animals are not amphibious, owing to the circumstance that in their conformation while in the embryonic condition there got intermixed into them some portion of the matter of which their subsequent food is constituted; for, as was said above, what is in conformity with nature is to every single animal pleasant and agreeable.

Animals then have been categorized into terrestrial and aquatic in three ways, according to their assumption of air or of water, the temperament of their bodies, or the character of their food; and the mode of life of an animal corresponds to the category in which it is found. That is to say, in some cases the animal depends for its terrestrial or aquatic nature on temperament and diet combined, as well as upon its method of respiration; and sometimes on temperament and habits alone.

Of testaceans, some, that are incapable of motion, subsist on fresh water, for, as the sea water dissolves into its constituents, the fresh water from its greater thinness percolates through the grosser parts; in fact, they live on fresh water just as they were originally engendered from the same. Now that fresh water is contained in the sea and can be strained off from it can be proved in a thoroughly practical way. Take a thin vessel of moulded wax, attach a cord to it, and let it down quite empty into the sea: in twenty-four hours it will be found to contain a quantity of water, and the water will be fresh and drinkable.

Sea-anemones feed on such small fishes as come in their way. The mouth of this creature is in the middle of its body; and this fact may be clearly observed in the case of the larger varieties. Like the oyster it has a duct for the outlet of the residuum; and this duct is at the top of the animal. In other words, the sea-anemone corresponds to the inner fleshy part of the oyster, and the stone to which the one creature clings corresponds to the shell which encases the other.

The limpet detaches itself from the rock and goes about in quest of food. Of shell-fish that are mobile, some are carnivorous and live on little fishes, as for instance, the purple murex – and there can be no doubt that the purple murex is carnivorous, as it is caught by a bait of fish; others are carnivorous, but feed also on marine vegetation.

The sea-turtles feed on shell-fish – for, by the way, their mouths are extraordinarily hard; whatever object it seizes, stone or other, it crunches into bits, but when it leaves the water for dry land it browses on grass). These creatures suffer greatly, and oftentimes die when they lie on the surface of the water exposed to a scorching sun; for, when once they have risen to the surface, they find a difficulty in sinking again.

Crustaceans feed in like manner. They are omnivorous; that is to say, they live on stones, slime, sea-weed, and excrement – as for instance the rock-crab – and are also carnivorous. The crawfish or spiny-lobster can get the better of fishes even of the larger species, though in some of them it occasionally finds more than its match. Thus, this animal is so overmastered and cowed by the octopus that it dies of terror if it become aware of an octopus in the same net with itself. The crawfish can master the conger-eel, for owing to the rough spines of the crawfish the eel cannot slip away and elude its hold. The conger-eel, however, devours the octopus, for owing to the slipperiness of its antagonist the octopus can make nothing of it. The crawfish feeds on little fish, capturing them beside its hole or dwelling place; for, by the way, it is found out at sea on rough and stony bottoms, and in such places it makes its den. Whatever it catches, it puts into its mouth with its pincer-like claws, like the common crab. Its nature is to walk straight forward when it has nothing to fear, with its feelers hanging sideways; if it be frightened, it makes its escape backwards, darting off to a great distance. These animals fight one another with their claws, just as rams fight with their horns, raising them and striking their opponents; they are often also seen crowded together in herds. So much for the mode of life of the crustacean.

Molluscs are all carnivorous; and of molluscs the calamary and the sepia are more than a match for fishes even of the large species. The octopus for the most part gathers shellfish, extracts

the flesh, and feeds on that; in fact, fishermen recognize their holes by the number of shells lying about. Some say that the octopus devours its own species, but this statement is incorrect; it is doubtless founded on the fact that the creature is often found with its tentacles removed, which tentacles have really been eaten off by the conger.

Fishes, all without exception, feed on spawn in the spawning season; but in other respects the food varies with the varying species. Some fishes are exclusively carnivorous, as the cartilaginous genus, the conger, the channa or Serranus, the tunny, the bass, the synodon or Dentex, the amia, the sea-perch, and the muraena. The red mullet is carnivorous, but feeds also on sea-weed, on shell-fish, and on mud. The grey mullet feeds on mud, the dascyllus on mud and offal, the scarus or parrot-fish and the melanurus on sea-weed, the saupe on offal and sea-weed; the saupe feeds also on zostera, and is the only fish that is captured with a gourd. All fishes devour their own species, with the single exception of the cestreus or mullet; and the conger is especially ravenous in this respect. The cephalus and the mullet in general are the only fish that eat no flesh; this may be inferred from the facts that when caught they are never found with flesh in their intestines, and that the bait used to catch them is not flesh but barley-cake. Every fish of the mullet-kind lives on sea-weed and sand. The cephalus, called by some the ‘chelon’, keeps near in to the shore, the peraeas keeps out at a distance from it, and feeds on a mucous substance exuding from itself, and consequently is always in a starved condition. The cephalus lives in mud, and is in consequence heavy and slimy; it never feeds on any other fish. As it lives in mud, it has every now and then to make a leap upwards out of the mud so as to wash the slime from off its body. There is no creature known to prey upon the spawn of the cephalus, so that the species is exceedingly numerous; when, however, the is full-grown it is preyed upon by a number of fishes, and especially by

the acharnas or bass. Of all fishes the mullet is the most voracious and insatiable, and in consequence its belly is kept at full stretch; whenever it is not starving, it may be considered as out of condition. When it is frightened, it hides its head in mud, under the notion that it is hiding its whole body. The synodon is carnivorous and feeds on molluscs. Very often the synodon and the channa cast up their stomachs while chasing smaller fishes; for, be it remembered, fishes have their stomachs close to the mouth, and are not furnished with a gullet.

Some fishes then, as has been stated, are carnivorous, and carnivorous only, as the dolphin, the synodon, the gilt-head, the selachians, and the molluscs. Other fishes feed habitually on mud or sea-weed or sea-moss or the so-called stalk-weed or growing plants; as for instance, the phycis, the goby, and the rock-fish; and, by the way, the only meat that the phycis will touch is that of prawns. Very often, however, as has been stated, they devour one another, and especially do the larger ones devour the smaller. The proof of their being carnivorous is the fact that they can be caught with flesh for a bait. The mackerel, the tunny, and the bass are for the most part carnivorous, but they do occasionally feed on sea-weed. The sargue feeds on the leavings of the trigle or red mullet. The red mullet burrows in the mud, when it sets the mud in motion and quits its haunt, the sargue settles down into the place and feeds on what is left behind, and prevents any smaller fish from settling in the immediate vicinity.

Of all fishes the so-called scarus, or parrot, wrasse, is the only one known to chew the cud like a quadruped.

As a general rule the larger fishes catch the smaller ones in their mouths whilst swimming straight after them in the ordinary position; but the selachians, the dolphin, and all the cetacea must first turn over on their backs, as their mouths are

placed down below; this allows a fair chance of escape to the smaller fishes, and, indeed, if it were not so, there would be very few of the little fishes left, for the speed and voracity of the dolphin is something marvellous.

Of eels a few here and there feed on mud and on chance morsels of food thrown to them; the greater part of them subsist on fresh water. Eel-breeders are particularly careful to have the water kept perfectly clear, by its perpetually flowing on to flat slabs of stone and then flowing off again; sometimes they coat the eel-tanks with plaster. The fact is that the eel will soon choke if the water is not clear as his gills are peculiarly small. On this account, when fishing for eels, they disturb the water. In the river Strymon eel-fishing takes place at the rising of the Pleiads, because at this period the water is troubled and the mud raised up by contrary winds; unless the water be in this condition, it is as well to leave the eels alone. When dead the eel, unlike the majority of fishes, neither floats on nor rises to the surface; and this is owing to the smallness of the stomach. A few eels are supplied with fat, but the greater part have no fat whatsoever. When removed from the water they can live for five or six days; for a longer period if north winds prevail, for a shorter if south winds. If they are removed in summer from the pools to the tanks they will die; but not so if removed in the winter. They are not capable of holding out against any abrupt change; consequently they often die in large numbers when men engaged in transporting them from one place to another dip them into water particularly cold. They will also die of suffocation if they be kept in a scanty supply of water. This same remark will hold good for fishes in general; for they are suffocated if they be long confined in a short supply of water, with the water kept unchanged – just as animals that respire are suffocated if they be shut up with a scanty supply of air. The eel in some cases lives for seven or eight years. The river-eel feeds on his own species, on grass, or on roots, or on any chance

food found in the mud. Their usual feeding-time is at night, and during the day-time they retreat into deep water. And so much for the food of fishes.

3

Of birds, such as have crooked talons are carnivorous without exception, and cannot swallow corn or bread-food even if it be put into their bills in tit-bits; as for instance, the eagle of every variety, the kite, the two species of hawks, to wit, the dove-hawk and the sparrow-hawk – and, by the way, these two hawks differ greatly in size from one another – and the buzzard. The buzzard is of the same size as the kite, and is visible at all seasons of the year. There is also the phene (or lammergeier) and the vulture. The phene is larger than the common eagle and is ashen in colour. Of the vulture there are two varieties: one small and whitish, the other comparatively large and rather more ashen-coloured than white. Further, of birds that fly by night, some have crooked talons, such as the night-raven, the owl, and the eagle-owl. The eagle-owl resembles the common owl in shape, but it is quite as large as the eagle. Again, there is the eleus, the Aegolian owl, and the little horned owl. Of these birds, the eleus is somewhat larger than the barn-door cock, and the Aegolian owl is of about the same size as the eleus, and both these birds hunt the jay; the little horned owl is smaller than the common owl. All these three birds are alike in appearance, and all three are carnivorous.

Again, of birds that have not crooked talons some are carnivorous, such as the swallow. Others feed on grubs, such as the chaffinch, the sparrow, the 'batis', the green linnet, and the titmouse. Of the titmouse there are three varieties. The largest

is the finch-titmouse – for it is about the size of a finch; the second has a long tail, and from its habitat is called the hill-titmouse; the third resembles the other two in appearance, but is less in size than either of them. Then come the becca-fico, the black-cap, the bull-finch, the robin, the epilais, the midget-bird, and the golden-crested wren. This wren is little larger than a locust, has a crest of bright red gold, and is in every way a beautiful and graceful little bird. Then the anthus, a bird about the size of a finch; and the mountain-finch, which resembles a finch and is of much the same size, but its neck is blue, and it is named from its habitat; and lastly the wren and the rook. The above-enumerated birds and the like of them feed either wholly or for the most part on grubs, but the following and the like feed on thistles; to wit, the linnet, the thraupis, and the goldfinch. All these birds feed on thistles, but never on grubs or any living thing whatever; they live and roost also on the plants from which they derive their food.

There are other birds whose favourite food consists of insects found beneath the bark of trees; as for instance, the great and the small pie, which are nicknamed the woodpeckers. These two birds resemble one another in plumage and in note, only that the note of the larger bird is the louder of the two; they both frequent the trunks of trees in quest of food. There is also the greenpie, a bird about the size of a turtle-dove, green-coloured all over, that pecks at the bark of trees with extraordinary vigour, lives generally on the branch of a tree, has a loud note, and is mostly found in the Peloponnese. There is another bird called the 'grub-picker' (or tree-creeper), about as small as the penduline titmouse, with speckled plumage of an ashen colour, and with a poor note; it is a variety of the woodpecker.

There are other birds that live on fruit and herbage, such as the wild pigeon or ringdove, the common pigeon, the rock-dove, and

the turtle-dove. The ring-dove and the common pigeon are visible at all seasons; the turtledove only in the summer, for in winter it lurks in some hole or other and is never seen. The rock-dove is chiefly visible in the autumn, and is caught at that season; it is larger than the common pigeon but smaller than the wild one; it is generally caught while drinking. These pigeons bring their young ones with them when they visit this country. All our other birds come to us in the early summer and build their nests here, and the greater part of them rear their young on animal food, with the sole exception of the pigeon and its varieties.

The whole genus of birds may be pretty well divided into such as procure their food on dry land, such as frequent rivers and lakes, and such as live on or by the sea.

Of water-birds such as are web-footed live actually on the water, while such as are split-footed live by the edge of it – and, by the way, water-birds that are not carnivorous live on water-plants, (but most of them live on fish), like the heron and the spoonbill that frequent the banks of lakes and rivers; and the spoonbill, by the way, is less than the common heron, and has a long flat bill. There are furthermore the stork and the seamew; and the seamew, by the way, is ashen-coloured. There is also the schoenilus, the cinclus, and the white-rump. Of these smaller birds the last mentioned is the largest, being about the size of the common thrush; all three may be described as 'wag-tails'. Then there is the scalidris, with plumage ashen-grey, but speckled. Moreover, the family of the halcyons or kingfishers live by the waterside. Of kingfishers there are two varieties; one that sits on reeds and sings; the other, the larger of the two, is without a note. Both these varieties are blue on the back. There is also the trochilus (or sandpiper). The halcyon also, including a variety termed the cerylus, is found near the seaside. The crow also feeds on such animal life as is cast up on the beach, for the

bird is omnivorous. There are also the white gull, the cepphus, the aethyia, and the charadrius.

Of web-footed birds, the larger species live on the banks of rivers and lakes; as the swan, the duck, the coot, the grebe, and the teal – a bird resembling the duck but less in size – and the water-raven or cormorant. This bird is the size of a stork, only that its legs are shorter; it is web-footed and is a good swimmer; its plumage is black. It roosts on trees, and is the only one of all such birds as these that is found to build its nest in a tree. Further there is the large goose, the little gregarious goose, the vulpanser, the horned grebe, and the penelops. The sea-eagle lives in the neighbourhood of the sea and seeks its quarry in lagoons.

A great number of birds are omnivorous. Birds of prey feed on any animal or bird, other than a bird of prey, that they may catch. These birds never touch one of their own genus, whereas fishes often devour members actually of their own species.

Birds, as a rule, are very spare drinkers. In fact birds of prey never drink at all, excepting a very few, and these drink very rarely; and this last observation is peculiarly applicable to the kestrel. The kite has been seen to drink, but he certainly drinks very seldom.

4

Animals that are coated with tessellates – such as the lizard and the other quadrupeds, and the serpents – are omnivorous: at all events they are carnivorous and graminivorous; and serpents, by the way, are of all animals the greatest gluttons.

Tessellated animals are spare drinkers, as are also all such animals as have a spongy lung, and such a lung, scantily supplied with blood, is found in all oviparous animals. Serpents, by the by, have an insatiate appetite for wine; consequently, at times men hunt for snakes by pouring wine into saucers and putting them into the interstices of walls, and the creatures are caught when inebriated. Serpents are carnivorous, and whenever they catch an animal they extract all its juices and eject the creature whole. And, by the way, this is done by all other creatures of similar habits, as for instance the spider; only that the spider sucks out the juices of its prey outside, and the serpent does so in its belly. The serpent takes any food presented to him, eats birds and animals, and swallows eggs entire. But after taking his prey he stretches himself until he stands straight out to the very tip, and then he contracts and squeezes himself into little compass, so that the swallowed mass may pass down his outstretched body; and this action on his part is due to the tenuity and length of his gullet. Spiders and snakes can both go without food for a long time; and this remark may be verified by observation of specimens kept alive in the shops of the apothecaries.

5

Of viviparous quadrupeds such as are fierce and jag-toothed are without exception carnivorous; though, by the way, it is stated of the wolf, but of no other animal, that in extremity of hunger it will eat a certain kind of earth. These carnivorous animals never eat grass except when they are sick, just as dogs bring on a vomit by eating grass and thereby purge themselves.

The solitary wolf is more apt to attack man than the wolf that goes with a pack.

The animal called ‘glanus’ by some and ‘hyaena’ by others is as large as a wolf, with a mane like a horse, only that the hair is stiffer and longer and extends over the entire length of the chine. It will lie in wait for a man and chase him, and will inveigle a dog within its reach by making a noise that resembles the retching noise of a man vomiting. It is exceedingly fond of putrefied flesh, and will burrow in a graveyard to gratify this propensity.

The bear is omnivorous. It eats fruit, and is enabled by the suppleness of its body to climb a tree; it also eats vegetables, and it will break up a hive to get at the honey; it eats crabs and ants also, and is in a general way carnivorous. It is so powerful that it will attack not only the deer but the wild boar, if it can take it unawares, and also the bull. After coming to close quarters with the bull it falls on its back in front of the animal, and, when the bull proceeds to butt, the bear seizes hold of the bull’s horns with its front paws, fastens its teeth into his shoulder, and drags him down to the ground. For a short time together it can walk erect on its hind legs. All the flesh it eats it first allows to become carrion.

The lion, like all other savage and jag-toothed animals, is carnivorous. It devours its food greedily and fiercely, and often swallows its prey entire without rending it at all; it will then go fasting for two or three days together, being rendered capable of this abstinence by its previous surfeit. It is a spare drinker. It discharges the solid residuum in small quantities, about every other day or at irregular intervals, and the substance of it is hard and dry like the excrement of a dog. The wind discharged from off its stomach is pungent, and its urine emits a strong odour, a phenomenon which, in the case of dogs, accounts for

their habit of sniffing at trees; for, by the way, the lion, like the dog, lifts its leg to void its urine. It infects the food it eats with a strong smell by breathing on it, and when the animal is cut open an overpowering vapour exhales from its inside.

Some wild quadrupeds feed in lakes and rivers; the seal is the only one that gets its living on the sea. To the former class of animals belong the so-called castor, the satyrium, the otter, and the so-called latax, or beaver. The beaver is flatter than the otter and has strong teeth; it often at night-time emerges from the water and goes nibbling at the bark of the aspens that fringe the riversides. The otter will bite a man, and it is said that whenever it bites it will never let go until it hears a bone crack. The hair of the beaver is rough, intermediate in appearance between the hair of the seal and the hair of the deer.

6

Jag-toothed animals drink by lapping, as do also some animals with teeth differently formed, as the mouse. Animals whose upper and lower teeth meet evenly drink by suction, as the horse and the ox; the bear neither laps nor sucks, but gulps down his drink. Birds, a rule, drink by suction, but the long necked birds stop and elevate their heads at intervals; the purple coot is the only one (of the long-necked birds) that swallows water by gulps.

Horned animals, domesticated or wild, and all such as are not jag-toothed, are all frugivorous and graminivorous, save under great stress of hunger. The pig is an exception, it cares little for grass or fruit, but of all animals it is the fondest of roots, owing to the fact that its snout is peculiarly adapted for digging them out of the ground; it is also of all animals the most easily

pleased in the matter of food. It takes on fat more rapidly in proportion to its size than any other animal; in fact, a pig can be fattened for the market in sixty days. Pig-dealers can tell the amount of flesh taken on, by having first weighed the animal while it was being starved. Before the fattening process begins, the creature must be starved for three days; and, by the way, animals in general will take on fat if subjected previously to a course of starvation; after the three days of starvation, pig-breeders feed the animal lavishly. Breeders in Thrace, when fattening pigs, give them a drink on the first day; then they miss one, and then two days, then three and four, until the interval extends over seven days. The pigs' meat used for fattening is composed of barley, millet, figs, acorns, wild pears, and cucumbers. These animals – and other animals that have warm bellies – are fattened by repose. (Pigs also fatten the better by being allowed to wallow in mud. They like to feed in batches of the same age. A pig will give battle even to a wolf.) If a pig be weighed when living, you may calculate that after death its flesh will weigh five-sixths of that weight, and the hair, the blood, and the rest will weigh the other sixth. When suckling their young, swine – like all other animals – get attenuated. So much for these animals.

7

Cattle feed on corn and grass, and fatten on vegetables that tend to cause flatulency, such as bitter vetch or bruised beans or bean-stalks. The older ones also will fatten if they be fed up after an incision has been made into their hide, and air blown thereinto. Cattle will fatten also on barley in its natural state or on barley finely winnowed, or on sweet food, such as figs, or pulp from the wine-press, or on elm-leaves. But nothing is so

fattening as the heat of the sun and wallowing in warm waters. If the horns of young cattle be smeared with hot wax, you may mold them to any shape you please, and cattle are less subject to disease of the hoof if you smear the horny parts with wax, pitch, or olive oil. Herded cattle suffer more when they are forced to change their pasture ground by frost than when snow is the cause of change. Cattle grow all the more in size when they are kept from sexual commerce over a number of years; and it is with a view to growth in size that in Epirus the so-called Pyrrhic kine are not allowed intercourse with the bull until they are nine years old; from which circumstance they are nicknamed the 'unbulled' kine. Of these Pyrrhic cattle, by the way, they say that there are only about four hundred in the world, that they are the private property of the Epirote royal family, that they cannot thrive out of Epirus, and that people elsewhere have tried to rear them, but without success.

8

Horses, mules, and asses feed on corn and grass, but are fattened chiefly by drink. Just in proportion as beasts of burden drink water, so will they more or less enjoy their food, and a place will give good or bad feeding according as the water is good or bad. Green corn, while ripening, will give a smooth coat; but such corn is injurious if the spikes are too stiff and sharp. The first crop of clover is unwholesome, and so is clover over which ill-scented water runs; for the clover is sure to get the taint of the water. Cattle like clear water for drinking; but the horse in this respect resembles the camel, for the camel likes turbid and thick water, and will never drink from a stream until he has trampled it into a turbid condition. And, by the way, the

camel can go without water for as much as four days, but after that when he drinks, he drinks in immense quantities.

9

The elephant at the most can eat nine Macedonian medimni of fodder at one meal; but so large an amount is unwholesome. As a general rule it can take six or seven medimni of fodder, five medimni of wheat, and five mareis of wine – six cotylae going to the maris. An elephant has been known to drink right off fourteen Macedonian metretae of water, and another metretae later in the day.

Camels live for about thirty years; in some exceptional cases they live much longer, and instances have been known of their living to the age of a hundred. The elephant is said by some to live for about two hundred years; by others, for three hundred.

10

Sheep and goats are graminivorous, but sheep browse assiduously and steadily, whereas goats shift their ground rapidly, and browse only on the tips of the herbage. Sheep are much improved in condition by drinking, and accordingly they give the flocks salt every five days in summer, to the extent of one medimnus to the hundred sheep, and this is found to render a flock healthier and fatter. In fact they mix salt with the greater part of their food; a large amount of salt is mixed into their bran (for the reason that they drink more when thirsty), and in autumn they get cucumbers with a sprinkling of salt on

them; this admixture of salt in their food tends also to increase the quantity of milk in the ewes. If sheep be kept on the move at midday they will drink more copiously towards evening; and if the ewes be fed with salted food as the lambing season draws near they will get larger udders. Sheep are fattened by twigs of the olive or of the oleaster, by vetch, and bran of every kind; and these articles of food fatten all the more if they be first sprinkled with brine. Sheep will take on flesh all the better if they be first put for three days through a process of starving. In autumn, water from the north is more wholesome for sheep than water from the south. Pasture grounds are all the better if they have a westerly aspect.

Sheep will lose flesh if they be kept overmuch on the move or be subjected to any hardship. In winter time shepherds can easily distinguish the vigorous sheep from the weakly, from the fact that the vigorous sheep are covered with hoar-frost while the weakly ones are quite free of it; the fact being that the weakly ones feeling oppressed with the burden shake themselves and so get rid of it. The flesh of all quadrupeds deteriorates in marshy pastures, and is the better on high grounds. Sheep that have flat tails can stand the winter better than long-tailed sheep, and short-fleeced sheep than the shaggy-fleeced; and sheep with crisp wool stand the rigour of winter very poorly. Sheep are healthier than goats, but goats are stronger than sheep. (The fleeces and the wool of sheep that have been killed by wolves, as also the clothes made from them, are exceptionally infested with lice.)

11

Of insects, such as have teeth are omnivorous; such as have a tongue feed on liquids only, extracting with that organ juices from all quarters. And of these latter some may be called omnivorous, inasmuch as they feed on every kind of juice, as for instance, the common fly; others are blood-suckers, such as the gadfly and the horse-fly, others again live on the juices of fruits and plants. The bee is the only insect that invariably eschews whatever is rotten; it will touch no article of food unless it have a sweet-tasting juice, and it is particularly fond of drinking water if it be found bubbling up clear from a spring underground.

So much for the food of animals of the leading genera.

12

The habits of animals are all connected with either breeding and the rearing of young, or with the procuring a due supply of food; and these habits are modified so as to suit cold and heat and the variations of the seasons. For all animals have an instinctive perception of the changes of temperature, and, just as men seek shelter in houses in winter, or as men of great possessions spend their summer in cool places and their winter in sunny ones, so also all animals that can do so shift their habitat at various seasons.

Some creatures can make provision against change without stirring from their ordinary haunts; others migrate, quitting Pontus and the cold countries after the autumnal equinox to avoid the approaching winter, and after the spring equinox migrating from warm lands to cool lands to avoid the coming

heat. In some cases they migrate from places near at hand, in others they may be said to come from the ends of the world, as in the case of the crane; for these birds migrate from the steppes of Scythia to the marshlands south of Egypt where the Nile has its source. And it is here, by the way, that they are said to fight with the pygmies; and the story is not fabulous, but there is in reality a race of dwarfish men, and the horses are little in proportion, and the men live in caves underground. Pelicans also migrate, and fly from the Strymon to the Ister, and breed on the banks of this river. They depart in flocks, and the birds in front wait for those in the rear, owing to the fact that when the flock is passing over the intervening mountain range, the birds in the rear lose sight of their companions in the van.

Fishes also in a similar manner shift their habitat now out of the Euxine and now into it. In winter they move from the outer sea in towards land in quest of heat; in summer they shift from shallow waters to the deep sea to escape the heat.

Weakly birds in winter and in frosty weather come down to the plains for warmth, and in summer migrate to the hills for coolness. The more weakly an animal is the greater hurry will it be in to migrate on account of extremes of temperature, either hot or cold; thus the mackerel migrates in advance of the tunnies, and the quail in advance of the cranes. The former migrates in the month of Boedromion, and the latter in the month of Maemacterion. All creatures are fatter in migrating from cold to heat than in migrating from heat to cold; thus the quail is fatter when he emigrates in autumn than when he arrives in spring. The migration from cold countries is contemporaneous with the close of the hot season. Animals are in better trim for breeding purposes in spring-time, when they change from hot to cool lands.

Of birds, the crane, as has been said, migrates from one end of the world to the other; they fly against the wind. The story told about the stone is untrue: to wit, that the bird, so the story goes, carries in its inside a stone by way of ballast, and that the stone when vomited up is a touchstone for gold.

The cushat and the rock-dove migrate, and never winter in our country, as is the case also with the turtle-dove; the common pigeon, however, stays behind. The quail also migrates; only, by the way, a few quails and turtle-doves may stay behind here and there in sunny districts. Cushats and turtle-doves flock together, both when they arrive and when the season for migration comes round again. When quails come to land, if it be fair weather or if a north wind is blowing, they will pair off and manage pretty comfortably; but if a southerly wind prevail they are greatly distressed owing to the difficulties in the way of flight, for a southerly wind is wet and violent. For this reason bird-catchers are never on the alert for these birds during fine weather, but only during the prevalence of southerly winds, when the bird from the violence of the wind is unable to fly. And, by the way, it is owing to the distress occasioned by the bulkiness of its body that the bird always screams while flying: for the labour is severe. When the quails come from abroad they have no leaders, but when they migrate hence, the glottis flits along with them, as does also the landrail, and the eared owl, and the corncrake. The corncrake calls them in the night, and when the birdcatchers hear the croak of the bird in the nighttime they know that the quails are on the move. The landrail is like a marsh bird, and the glottis has a tongue that can project far out of its beak. The eared owl is like an ordinary owl, only that it has feathers about its ears; by some it is called the night-raven. It is a great rogue of a bird, and is a capital mimic; a bird-catcher will dance before it and, while the bird is mimicking his gestures, the accomplice comes behind and catches it. The common owl is caught by a similar trick.

As a general rule all birds with crooked talons are short-necked, flat-tongued, and disposed to mimicry. The Indian bird, the parrot, which is said to have a man's tongue, answers to this description; and, by the way, after drinking wine, the parrot becomes more saucy than ever.

Of birds, the following are migratory – the crane, the swan, the pelican, and the lesser goose.

13

Of fishes, some, as has been observed, migrate from the outer seas in towards shore, and from the shore towards the outer seas, to avoid the extremes of cold and heat.

Fish living near to the shore are better eating than deep-sea fish. The fact is they have more abundant and better feeding, for wherever the sun's heat can reach vegetation is more abundant, better in quality, and more delicate, as is seen in any ordinary garden. Further, the black shore-weed grows near to shore; the other shore-weed is like wild weed. Besides, the parts of the sea near to shore are subjected to a more equable temperature; and consequently the flesh of shallow-water fishes is firm and consistent, whereas the flesh of deep-water fishes is flaccid and watery.

The following fishes are found near into the shore – the synodon, the black bream, the merou, the gilthead, the mullet, the red mullet, the wrasse, the weaver, the callionymus, the goby, and rock-fishes of all kinds. The following are deep-sea fishes – the trygon, the cartilaginous fishes, the white conger, the serranus, the erythrinus, and the glaucus. The braize, the sea-scorpion, the black conger, the muraena, and the piper or

sea-cuckoo are found alike in shallow and deep waters. These fishes, however, vary for various localities; for instance, the goby and all rock-fish are fat off the coast of Crete. Again, the tunny is out of season in summer, when it is being preyed on by its own peculiar louse-parasite, but after the rising of Arcturus, when the parasite has left it, it comes into season again. A number of fish also are found in sea-estuaries; such as the saupe, the gilthead, the red mullet, and, in point of fact, the greater part of the gregarious fishes. The bonito also is found in such waters, as, for instance, off the coast of Alopeconnesus; and most species of fishes are found in Lake Bistonis. The coly-mackerel as a rule does not enter the Euxine, but passes the summer in the Propontis, where it spawns, and winters in the Aegean. The tunny proper, the pelamys, and the bonito penetrate into the Euxine in summer and pass the summer there; as do also the greater part of such fish as swim in shoals with the currents, or congregate in shoals together. And most fish congregate in shoals, and shoal-fishes in all cases have leaders.

Fish penetrate into the Euxine for two reasons, and firstly for food. For the feeding is more abundant and better in quality owing to the amount of fresh river-water that discharges into the sea, and moreover, the large fishes of this inland sea are smaller than the large fishes of the outer sea. In point of fact, there is no large fish in the Euxine excepting the dolphin and the porpoise, and the dolphin is a small variety; but as soon as you get into the outer sea the big fishes are on the big scale. Furthermore, fish penetrate into this sea for the purpose of breeding; for there are recesses there favourable for spawning, and the fresh and exceptionally sweet water has an invigorating effect upon the spawn. After spawning, when the young fishes have attained some size, the parent fish swim out of the Euxine immediately after the rising of the Pleiads. If winter comes in with a southerly wind, they swim out with more or less of

deliberation; but, if a north wind be blowing, they swim out with greater rapidity, from the fact that the breeze is favourable to their own course. And, by the way, the young fish are caught about this time in the neighbourhood of Byzantium very small in size, as might have been expected from the shortness of their sojourn in the Euxine. The shoals in general are visible both as they quit and enter the Euxine. The trichiae, however, only can be caught during their entry, but are never visible during their exit; in point of fact, when a trichia is caught running outwards in the neighbourhood of Byzantium, the fishermen are particularly careful to cleanse their nets, as the circumstance is so singular and exceptional. The way of accounting for this phenomenon is that this fish, and this one only, swims northwards into the Danube, and then at the point of its bifurcation swims down southwards into the Adriatic. And, as a proof that this theory is correct, the very opposite phenomenon presents itself in the Adriatic; that is to say, they are not caught in that sea during their entry, but are caught during their exit.

Tunny-fish swim into the Euxine keeping the shore on their right, and swim out of it with the shore upon their left. It is stated that they do so as being naturally weak-sighted, and seeing better with the right eye.

During the daytime shoal-fish continue on their way, but during the night they rest and feed. But if there be moonlight, they continue their journey without resting at all. Some people accustomed to sea-life assert that shoal-fish at the period of the winter solstice never move at all, but keep perfectly still wherever they may happen to have been overtaken by the solstice, and this lasts until the equinox.

The coly-mackerel is caught more frequently on entering than on quitting the Euxine. And in the Propontis the fish is at its best before the spawning season. Shoal-fish, as a rule, are

caught in greater quantities as they leave the Euxine, and at that season they are in the best condition. At the time of their entrance they are caught in very plump condition close to shore, but those are in comparatively poor condition that are caught farther out to sea. Very often, when the coly-mackerel and the mackerel are met by a south wind in their exit, there are better catches to the southward than in the neighbourhood of Byzantium. So much then for the phenomenon of migration of fishes.

Now the same phenomenon is observed in fishes as in terrestrial animals in regard to hibernation: in other words, during winter fishes take to concealing themselves in out of the way places, and quit their places of concealment in the warmer season. But, by the way, animals go into concealment by way of refuge against extreme heat, as well as against extreme cold. Sometimes an entire genus will thus seek concealment; in other cases some species will do so and others will not. For instance, the shell-fish seek concealment without exception, as is seen in the case of those dwelling in the sea, the purple murex, the ceryx, and all such like; but though in the case of the detached species the phenomenon is obvious – for they hide themselves, as is seen in the scallop, or they are provided with an operculum on the free surface, as in the case of land snails – in the case of the non-detached the concealment is not so clearly observed. They do not go into hiding at one and the same season; but the snails go in winter, the purple murex and the ceryx for about thirty days at the rising of the Dog-star, and the scallop at about the same period. But for the most part they go into concealment when the weather is either extremely cold or extremely hot.

14

Insects almost all go into hiding, with the exception of such of them as live in human habitations or perish before the completion of the year. They hide in the winter; some of them for several days, others for only the coldest days, as the bee. For the bee also goes into hiding: and the proof that it does so is that during a certain period bees never touch the food set before them, and if a bee creeps out of the hive, it is quite transparent, with nothing whatsoever in its stomach; and the period of its rest and hiding lasts from the setting of the Pleiads until springtime.

Animals take their winter-sleep or summer-sleep by concealing themselves in warm places, or in places where they have been used to lie concealed.

15

Several blooded animals take this sleep, such as the pholidotes or tessellates, namely, the serpent, the lizard, the gecko, and the river. crocodile, all of which go into hiding for four months in the depth of winter, and during that time eat nothing. Serpents in general burrow under ground for this purpose; the viper conceals itself under a stone.

A great number of fishes also take this sleep, and notably, the hippurus and coracinus in winter time; for, whereas fish in general may be caught at all periods of the year more or less, there is this singularity observed in these fishes, that they are caught within a certain fixed period of the year, and never by any chance out of it. The muraena also hides, and the orphus or sea-perch, and the conger. Rock-fish pair off, male and female,

for hiding (just as for breeding); as is observed in the case of the species of wrasse called the thrush and the owzel, and in the perch.

The tunny also takes a sleep in winter in deep waters, and gets exceedingly fat after the sleep. The fishing season for the tunny begins at the rising of the Pleiads and lasts, at the longest, down to the setting of Arcturus; during the rest of the year they are hid and enjoying immunity. About the time of hibernation a few tunnies or other hibernating fishes are caught while swimming about, in particularly warm localities and in exceptionally fine weather, or on nights of full moon; for the fishes are induced (by the warmth or the light) to emerge for a while from their lair in quest of food.

Most fishes are at their best for the table during the summer or winter sleep.

The primas-tunny conceals itself in the mud; this may be inferred from the fact that during a particular period the fish is never caught, and that, when it is caught after that period, it is covered with mud and has its fins damaged. In the spring these tunnies get in motion and proceed towards the coast, coupling and breeding, and the females are now caught full of spawn. At this time they are considered as in season, but in autumn and in winter as of inferior quality; at this time also the males are full of milt. When the spawn is small, the fish is hard to catch, but it is easily caught when the spawn gets large, as the fish is then infested by its parasite. Some fish burrow for sleep in the sand and some in mud, just keeping their mouths outside.

Most fishes hide, then, during the winter only, but crustaceans, the rock-fish, the ray, and the cartilaginous species hide only during extremely severe weather, and this may be inferred from the fact that these fishes are never by any chance caught when the weather is extremely cold. Some fishes, however, hide

during the summer, as the glaucus or grey-back; this fish hides in summer for about sixty days. The hake also and the gilthead hide; and we infer that the hake hides over a lengthened period from the fact that it is only caught at long intervals. We are led also to infer that fishes hide in summer from the circumstance that the takes of certain fish are made between the rise and setting of certain constellations: of the Dog-star in particular, the sea at this period being upturned from the lower depths. This phenomenon may be observed to best advantage in the Bosporus; for the mud is there brought up to the surface and the fish are brought up along with it. They say also that very often, when the sea-bottom is dredged, more fish will be caught by the second haul than by the first one. Furthermore, after very heavy rains numerous specimens become visible of creatures that at other times are never seen at all or seen only at intervals.

16

A great number of birds also go into hiding; they do not all migrate, as is generally supposed, to warmer countries. Thus, certain birds (as the kite and the swallow) when they are not far off from places of this kind, in which they have their permanent abode, betake themselves thither; others, that are at a distance from such places, decline the trouble of migration and simply hide themselves where they are. Swallows, for instance, have been often found in holes, quite denuded of their feathers, and the kite on its first emergence from torpidity has been seen to fly from out some such hiding-place. And with regard to this phenomenon of periodic torpor there is no distinction observed, whether the talons of a bird be crooked or straight; for instance, the stork, the owzel, the turtle-dove, and the lark, all go into

hiding. The case of the turtledove is the most notorious of all, for we would defy any one to assert that he had anywhere seen a turtle-dove in winter-time; at the beginning of the hiding time it is exceedingly plump, and during this period it moults, but retains its plumpness. Some cushats hide; others, instead of hiding, migrate at the same time as the swallow. The thrush and the starling hide; and of birds with crooked talons the kite and the owl hide for a few days.

17

Of viviparous quadrupeds the porcupine and the bear retire into concealment. The fact that the bear hides is well established, but there are doubts as to its motive for so doing, whether it be by reason of the cold or from some other cause. About this period the male and the female become so fat as to be hardly capable of motion. The female brings forth her young at this time, and remains in concealment until it is time to bring the cubs out; and she brings them out in spring, about three months after the winter solstice. The bear hides for at least forty days; during fourteen of these days it is said not to move at all, but during most of the subsequent days it moves, and from time to time wakes up. A she-bear in pregnancy has either never been caught at all or has been caught very seldom. There can be no doubt but that during this period they eat nothing; for in the first place they never emerge from their hiding-place, and further, when they are caught, their belly and intestines are found to be quite empty. It is also said that from no food being taken the gut almost closes up, and that in consequence the animal on first emerging takes to eating arum with the view of opening up and distending the gut.

The dormouse actually hides in a tree, and gets very fat at that period; as does also the white mouse of Pontus.

(Of animals that hide or go torpid some slough off what is called their 'old-age'. This name is applied to the outermost skin, and to the casing that envelops the developing organism.)

In discussing the case of terrestrial vivipara we stated that the reason for the bear's seeking concealment is an open question. We now proceed to treat of the tessellates. The tessellates for the most part go into hiding, and if their skin is soft they slough off their 'old-age', but not if the skin is shell-like, as is the shell of the tortoise – for, by the way, the tortoise and the fresh water tortoise belong to the tessellates. Thus, the old-age is sloughed off by the gecko, the lizard, and above all, by serpents; and they slough off the skin in springtime when emerging from their torpor, and again in the autumn. Vipers also slough off their skin both in spring and in autumn, and it is not the case, as some aver, that this species of the serpent family is exceptional in not sloughing. When the serpent begins to slough, the skin peels off at first from the eyes, so that any one ignorant of the phenomenon would suppose the animal were going blind; after that it peels off the head, and so on, until the creature presents to view only a white surface all over. The sloughing goes on for a day and a night, beginning with the head and ending with the tail. During the sloughing of the skin an inner layer comes to the surface, for the creature emerges just as the embryo from its afterbirth.

All insects that slough at all slough in the same way; as the silphe, and the empis or midge, and all the coleoptera, as for instance the cantharus-beetle. They all slough after the period of development; for just as the afterbirth breaks from off the young of the vivipara so the outer husk breaks off from around the young of the vermipara, in the same way both with the bee

and the grasshopper. The cicada the moment after issuing from the husk goes and sits upon an olive tree or a reed; after the breaking up of the husk the creature issues out, leaving a little moisture behind, and after a short interval flies up into the air and sets a. chirping.

Of marine animals the crawfish and the lobster slough sometimes in the spring, and sometimes in autumn after parturition. Lobsters have been caught occasionally with the parts about the thorax soft, from the shell having there peeled off, and the lower parts hard, from the shell having not yet peeled off there; for, by the way, they do not slough in the same manner as the serpent. The crawfish hides for about five months. Crabs also slough off their old-age; this is generally allowed with regard to the soft-shelled crabs, and it is said to be the case with the testaceous kind, as for instance with the large 'granny' crab. When these animals slough their shell becomes soft all over, and as for the crab, it can scarcely crawl. These animals also do not cast their skins once and for all, but over and over again.

So much for the animals that go into hiding or torpidity, for the times at which, and the ways in which, they go; and so much also for the animals that slough off their old-age, and for the times at which they undergo the process.

18

Animals do not all thrive at the same seasons, nor do they thrive alike during all extremes of weather. Further animals of diverse species are in a diverse way healthy or sickly at certain seasons; and, in point of fact, some animals have ailments that are unknown to others. Birds thrive in times of drought, both in

their general health and in regard to parturition, and this is especially the case with the cushat; fishes, however, with a few exceptions, thrive best in rainy weather; on the contrary rainy seasons are bad for birds – and so by the way is much drinking – and drought is bad for fishes. Birds of prey, as has been already stated, may in a general way be said never to drink at all, though Hesiod appears to have been ignorant of the fact, for in his story about the siege of Ninus he represents the eagle that presided over the auguries as in the act of drinking; all other birds drink, but drink sparingly, as is the case also with all other spongy-lunged oviparous animals. Sickness in birds may be diagnosed from their plumage, which is ruffled when they are sickly instead of lying smooth as when they are well.

19

The majority of fishes, as has been stated, thrive best in rainy seasons. Not only have they food in greater abundance at this time, but in a general way rain is wholesome for them just as it is for vegetation – for, by the way, kitchen vegetables, though artificially watered, derive benefit from rain; and the same remark applies even to reeds that grow in marshes, as they hardly grow at all without a rainfall. That rain is good for fishes may be inferred from the fact that most fishes migrate to the Euxine for the summer; for owing to the number of the rivers that discharge into this sea its water is exceptionally fresh, and the rivers bring down a large supply of food. Besides, a great number of fishes, such as the bonito and the mullet, swim up the rivers and thrive in the rivers and marshes. The sea-gudgeon also fattens in the rivers, and, as a rule, countries abounding in lagoons furnish unusually excellent fish. While most fishes, then, are benefited by rain, they are chiefly

benefited by summer rain; or we may state the case thus, that rain is good for fishes in spring, summer, and autumn, and fine dry weather in winter. As a general rule what is good for men is good for fishes also.

Fishes do not thrive in cold places, and those fishes suffer most in severe winters that have a stone in their head, as the chromis, the basse, the sciaena, and the braize; for owing to the stone they get frozen with the cold, and are thrown up on shore.

Whilst rain is wholesome for most fishes, it is, on the contrary, unwholesome for the mullet, the cephalus, and the so-called marinus, for rain superinduces blindness in most of these fishes, and all the more rapidly if the rainfall be superabundant. The cephalus is peculiarly subject to this malady in severe winters; their eyes grow white, and when caught they are in poor condition, and eventually the disease kills them. It would appear that this disease is due to extreme cold even more than to an excessive rainfall; for instance, in many places and more especially in shallows off the coast of Nauplia, in the Argolid, a number of fishes have been known to be caught out at sea in seasons of severe cold. The gilthead also suffers in winter; the acharnas suffers in summer, and loses condition. The coracine is exceptional among fishes in deriving benefit from drought, and this is due to the fact that heat and drought are apt to come together.

Particular places suit particular fishes; some are naturally fishes of the shore, and some of the deep sea, and some are at home in one or the other of these regions, and others are common to the two and are at home in both. Some fishes will thrive in one particular spot, and in that spot only. As a general rule it may be said that places abounding in weeds are wholesome; at all events, fishes caught in such places are exceptionally fat: that is, such fishes a a habit all sorts of localities as well. The fact is

that weed-eating fishes find abundance of their special food in such localities, and carnivorous fish find an unusually large number of smaller fish. It matters also whether the wind be from the north or south: the longer fish thrive better when a north wind prevails, and in summer at one and the same spot more long fish will be caught than flat fish with a north wind blowing.

The tunny and the sword-fish are infested with a parasite about the rising of the Dog-star; that is to say, about this time both these fishes have a grub beside their fins that is nicknamed the ‘gadfly’. It resembles the scorpion in shape, and is about the size of the spider. So acute is the pain it inflicts that the sword-fish will often leap as high out of the water as a dolphin; in fact, it sometimes leaps over the bulwarks of a vessel and falls back on the deck. The tunny delights more than any other fish in the heat of the sun. It will burrow for warmth in the sand in shallow waters near to shore, or will, because it is warm, disport itself on the surface of the sea.

The fry of little fishes escape by being overlooked, for it is only the larger ones of the small species that fishes of the large species will pursue. The greater part of the spawn and the fry of fishes is destroyed by the heat of the sun, for whatever of them the sun reaches it spoils.

Fishes are caught in greatest abundance before sunrise and after sunset, or, speaking generally, just about sunset and sunrise. Fishermen haul up their nets at these times, and speak of the hauls then made as the ‘nick-of-time’ hauls. The fact is, that at these times fishes are particularly weak-sighted; at night they are at rest, and as the light grows stronger they see comparatively well.

We know of no pestilential malady attacking fishes, such as those which attack man, and horses and oxen among the

quadrupedal vivipara, and certain species of other genera, domesticated and wild; but fishes do seem to suffer from sickness; and fishermen infer this from the fact that at times fishes in poor condition, and looking as though they were sick, and of altered colour, are caught in a large haul of well-conditioned fish of their own species. So much for sea-fishes.

20

River-fish and lake-fish also are exempt from diseases of a pestilential character, but certain species are subject to special and peculiar maladies. For instance, the sheat-fish just before the rising of the Dog-star, owing to its swimming near the surface of the water, is liable to sunstroke, and is paralysed by a loud peal of thunder. The carp is subject to the same eventualities but in a lesser degree. The sheatfish is destroyed in great quantities in shallow waters by the serpent called the dragon. In the balerus and tilon a worm is engendered about the rising of the Dog-star, that sickens these fish and causes them to rise towards the surface, where they are killed by the excessive heat. The chalcis is subject to a very violent malady; lice are engendered underneath their gills in great numbers, and cause destruction among them; but no other species of fish is subject to any such malady.

If mullein be introduced into water it will kill fish in its vicinity. It is used extensively for catching fish in rivers and ponds; by the Phoenicians it is made use of also in the sea.

There are two other methods employed for catch-fish. It is a known fact that in winter fishes emerge from the deep parts of rivers and, by the way, at all seasons fresh water is tolerably cold. A trench accordingly is dug leading into a river, and

wattled at the river end with reeds and stones, an aperture being left in the wattling through which the river water flows into the trench; when the frost comes on the fish can be taken out of the trench in weels. Another method is adopted in summer and winter alike. They run across a stream a dam composed of brushwood and stones leaving a small open space, and in this space they insert a weel; they then coop the fish in towards this place, and draw them up in the weel as they swim through the open space.

Shell-fish, as a rule, are benefited by rainy weather. The purple murex is an exception; if it be placed on a shore near to where a river discharges, it will die within a day after tasting the fresh water. The murex lives for about fifty days after capture; during this period they feed off one another, as there grows on the shell a kind of sea-weed or sea-moss; if any food is thrown to them during this period, it is said to be done not to keep them alive, but to make them weigh more.

To shell-fish in general drought is unwholesome. During dry weather they decrease in size and degenerate in quality; and it is during such weather that the red scallop is found in more than usual abundance. In the Pyrrhaean Strait the clam was exterminated, partly by the dredging-machine used in their capture, and partly by long-continued droughts. Rainy weather is wholesome to the generality of shellfish owing to the fact that the sea-water then becomes exceptionally sweet. In the Euxine, owing to the coldness of the climate, shellfish are not found: nor yet in rivers, excepting a few bivalves here and there. Univalves, by the way, are very apt to freeze to death in extremely cold weather. So much for animals that live in water.

21

To turn to quadrupeds, the pig suffers from three diseases, one of which is called branchos, a disease attended with swellings about the windpipe and the jaws. It may break out in any part of the body; very often it attacks the foot, and occasionally the ear; the neighbouring parts also soon rot, and the decay goes on until it reaches the lungs, when the animal succumbs. The disease develops with great rapidity, and the moment it sets in the animal gives up eating. The swineherds know but one way to cure it, namely, by complete excision, when they detect the first signs of the disease. There are two other diseases, which are both alike termed craurus. The one is attended with pain and heaviness in the head, and this is the commoner of the two, the other with diarrhoea. The latter is incurable, the former is treated by applying wine fomentations to the snout and rinsing the nostrils with wine. Even this disease is very hard to cure; it has been known to kill within three or four days. The animal is chiefly subject to branchos when it gets extremely fat, and when the heat has brought a good supply of figs. The treatment is to feed on mashed mulberries, to give repeated warm baths, and to lance the under part of the tongue.

Pigs with flabby flesh are subject to measles about the legs, neck, and shoulders, for the pimples develop chiefly in these parts. If the pimples are few in number the flesh is comparatively sweet, but if they be numerous it gets watery and flaccid. The symptoms of measles are obvious, for the pimples show chiefly on the under side of the tongue, and if you pluck the bristles off the chine the skin will appear suffused with blood, and further the animal will be unable to keep its hind-feet at rest. Pigs never take this disease while they are mere sucklings. The pimples may be got rid of by feeding on this kind of spelt called tiphe; and this spelt, by the way, is very good for ordinary food. The best food for rearing and fattening pigs is

chickpeas and figs, but the one thing essential is to vary the food as much as possible, for this animal, like animals in general lights in a change of diet; and it is said that one kind of food blows the animal out, that another superinduces flesh, and that another puts on fat, and that acorns, though liked by the animal, render the flesh flaccid. Besides, if a sow eats acorns in great quantities, it will miscarry, as is also the case with the ewe; and, indeed, the miscarriage is more certain in the case of the ewe than in the case of the sow. The pig is the only animal known to be subject to measles.

22

Dogs suffer from three diseases; rabies, quinsy, and sore feet. Rabies drives the animal mad, and ary animal whatever, excepting man, will take the disease if bitten by a dog so afflicted; the disease is fatal to the dog itself, and to any animal it may bite, man excepted. Quinsy also is fatal to dogs; and only a few recover from disease of the feet. The camel, like the dog, is subject to rabies. The elephant, which is reputed to enjoy immunity from all other illnesses, is occasionally subject to flatulency.

23

Cattle in herds are liable to two diseases, foot, sickness and craurus. In the former their feet suffer from eruptions, but the animal recovers from the disease without even the loss of the hoof. It is found of service to smear the horny parts with warm

pitch. In craurus, the breath comes warm at short intervals; in fact, craurus in cattle answers to fever in man. The symptoms of the disease are drooping of the ears and disinclination for food. The animal soon succumbs, and when the carcase is opened the lungs are found to be rotten.

24

Horses out at pasture are free from all diseases excepting disease of the feet. From this disease they sometimes lose their hooves: but after losing them they grow them soon again, for as one hoof is decaying it is being replaced by another. Symptoms of the malady are a sinking in and wrinkling of the lip in the middle under the nostrils, and in the case of the male, a twitching of the right testicle.

Stall-reared horses are subject to very numerous forms of disease. They are liable to disease called 'eileus'. Under this disease the animal trails its hind-legs under its belly so far forward as almost to fall back on its haunches; if it goes without food for several days and turns rabid, it may be of service to draw blood, or to castrate the male. The animal is subject also to tetanus: the veins get rigid, as also the head and neck, and the animal walks with its legs stretched out straight. The horse suffers also from abscesses. Another painful illness afflicts them called the 'barley-surfeit'. The are a softening of the palate and heat of the breath; the animal may recover through the strength of its own constitution, but no formal remedies are of any avail.

There is also a disease called nymphia, in which the animal is said to stand still and droop its head on hearing flute-music; if during this ailment the horse be mounted, it will run off at a

gallop until it is pulled. Even with this rabies in full force, it preserves a dejected spiritless appearance; some of the symptoms are a throwing back of the ears followed by a projection of them, great languor, and heavy breathing. Heart-ache also is incurable, of which the symptom is a drawing in of the flanks; and so is displacement of the bladder, which is accompanied by a retention of urine and a drawing up of the hooves and haunches. Neither is there any cure if the animal swallow the grape-beetle, which is about the size of the sphondyle or knuckle-beetle. The bite of the shrewmouse is dangerous to horses and other draught animals as well; it is followed by boils. The bite is all the more dangerous if the mouse be pregnant when she bites, for the boils then burst, but do not burst otherwise. The cicigna-called 'chalcis' by some, and 'zignis' by others – either causes death by its bite or, at all events, intense pain; it is like a small lizard, with the colour of the blind snake. In point of fact, according to experts, the horse and the sheep have pretty well as many ailments as the human species. The drug known under the name of 'sandarace' or realgar, is extremely injurious to a horse, and to all draught animals; it is given to the animal as a medicine in a solution of water, the liquid being filtered through a colander. The mare when pregnant apt to miscarry when disturbed by the odour of an extinguished candle; and a similar accident happens occasionally to women in their pregnancy. So much for the diseases of the horse.

The so-called hippomanes grows, as has stated, on the foal, and the mare nibbles it off as she licks and cleans the foal. All the curious stories connected with the hippomanes are due to old wives and to the venders of charms. What is called the 'polium' or foal's membrane, is, as all the accounts state, delivered by the mother before the foal appears.

A horse will recognize the neighing of any other horse with which it may have fought at any previous period. The horse delights in meadows and marshes, and likes to drink muddy water; in fact, if water be clear, the horse will trample in it to make it turbid, will then drink it, and afterwards will wallow in it. The animal is fond of water in every way, whether for drinking or for bathing purposes; and this explains the peculiar constitution of the hippopotamus or river-horse. In regard to water the ox is the opposite of the horse; for if the water be impure or cold, or mixed up with alien matter, it will refuse to drink it.

25

The ass suffers chiefly from one particular disease which they call 'melis'. It arises first in the head, and a clammy humour runs down the nostrils, thick and red; if it stays in the head the animal may recover, but if it descends into the lungs the animal will die. Of all animals on its of its kind it is the least capable of enduring extreme cold, which circumstance will account for the fact that the animal is not found on the shores of the Euxine, nor in Scythia.

26

Elephants suffer from flatulence, and when thus afflicted can void neither solid nor liquid residuum. If the elephant swallow earth-mould it suffers from relaxation; but if it go on taking it steadily, it will experience no harm. From time to time it takes

to swallowing stones. It suffers also from diarrhoea: in this case they administer draughts of lukewarm water or dip its fodder in honey, and either one or the other prescription will prove a costive. When they suffer from insomnia, they will be restored to health if their shoulders be rubbed with salt, olive-oil, and warm water; when they have aches in their shoulders they will derive great benefit from the application of roast pork. Some elephants like olive oil, and others do not. If there is a bit of iron in the inside of an elephant it is said that it will pass out if the animal takes a drink of olive-oil; if the animal refuses olive-oil, they soak a root in the oil and give it the root to swallow. So much, then, for quadrupeds.

27

Insects, as a general rule, thrive best in the time of year in which they come into being, especially if the season be moist and warm, as in spring.

In bee-hives are found creatures that do great damage to the combs; for instance, the grub that spins a web and ruins the honeycomb: it is called the 'cleros'. It engenders an insect like itself, of a spider-shape, and brings disease into the swarm. There is another insect resembling the moth, called by some the 'pyraustes', that flies about a lighted candle: this creature engenders a brood full of a fine down. It is never stung by a bee, and can only be got out of a hive by fumigation. A caterpillar also is engendered in hives, of a species nicknamed the teredo, or 'borer', with which creature the bee never interferes. Bees suffer most when flowers are covered with mildew, or in seasons of drought.

All insects, without exception, die if they be smeared over with oil; and they die all the more rapidly if you smear their head with the oil and lay them out in the sun.

28

Variety in animal life may be produced by variety of locality: thus in one place an animal will not be found at all, in another it will be small, or short-lived, or will not thrive. Sometimes this sort of difference is observed in closely adjacent districts. Thus, in the territory of Miletus, in one district cicadas are found while there are none in the district close adjoining; and in Cephalenia there is a river on one side of which the cicada is found and not on the other. In Pordoselene there is a public road one side of which the weasel is found but not on the other. In Boeotia the mole is found in great abundance in the neighbourhood of Orchomenus, but there are none in Lebadia though it is in the immediate vicinity, and if a mole be transported from the one district to the other it will refuse to burrow in the soil. The hare cannot live in Ithaca if introduced there; in fact it will be found dead, turned towards the point of the beach where it was landed. The horseman-ant is not found in Sicily; the croaking frog has only recently appeared in the neighbourhood of Cyrene. In the whole of Libya there is neither wild boar, nor stag, nor wild goat; and in India, according to Ctesias – no very good authority, by the way – there are no swine, wild or tame, but animals that are devoid of blood and such as go into hiding or go torpid are all of immense size there. In the Euxine there are no small molluscs nor testaceans, except a few here and there; but in the Red Sea all the testaceans are exceedingly large. In Syria the sheep have tails a cubit in breadth; the goats have ears a span and a palm long,

and some have ears that flap down to the ground; and the cattle have humps on their shoulders, like the camel. In Lycia goats are shorn for their fleece, just as sheep are in all other countries. In Libya the long-horned ram is born with horns, and not the ram only, as Homer' words it, but the ewe as well; in Pontus, on the confines of Scythia, the ram is without horns.

In Egypt animals, as a rule, are larger than their congeners in Greece, as the cow and the sheep; but some are less, as the dog, the wolf, the hare, the fox, the raven, and the hawk; others are of pretty much the same size, as the crow and the goat. The difference, where it exists, is attributed to the food, as being abundant in one case and insufficient in another, for instance for the wolf and the hawk; for provision is scanty for the carnivorous animals, small birds being scarce; food is scanty also for the hare and for all frugivorous animals, because neither the nuts nor the fruit last long.

In many places the climate will account for peculiarities; thus in Illyria, Thrace, and Epirus the ass is small, and in Gaul and in Scythia the ass is not found at all owing to the coldness of the climate of these countries. In Arabia the lizard is more than a cubit in length, and the mouse is much larger than our field-mouse, with its hind-legs a span long and its front legs the length of the first finger-joint. In Libya, according to all accounts, the length of the serpents is something appalling; sailors spin a yarn to the effect that some crews once put ashore and saw the bones of a number of oxen, and that they were sure that the oxen had been devoured by serpents, for, just as they were putting out to sea, serpents came chasing their galleys at full speed and overturned one galley and set upon the crew. Again, lions are more numerous in Libya, and in that district of Europe that lies between the Achelous and the Nessus; the leopard is more abundant in Asia Minor, and is not found in Europe at all. As a general rule, wild animals are at

their wildest in Asia, at their boldest in Europe, and most diverse in form in Libya; in fact, there is an old saying, 'Always something fresh in Libya.'

It would appear that in that country animals of diverse species meet, on account of the rainless climate, at the watering-places, and there pair together; and that such pairs will often breed if they be nearly of the same size and have periods of gestation of the same length. For it is said that they are tamed down in their behaviour towards each other by extremity of thirst. And, by the way, unlike animals elsewhere, they require to drink more in wintertime than in summer: for they acquire the habit of not drinking in summer, owing to the circumstance that there is usually no water then; and the mice, if they drink, die. Elsewhere also bastard-animals are born to heterogeneous pairs; thus in Cyrene the wolf and the bitch will couple and breed; and the Laconian hound is a cross between the fox and the dog. They say that the Indian dog is a cross between the tiger and the bitch, not the first cross, but a cross in the third generation; for they say that the first cross is a savage creature. They take the bitch to a lonely spot and tie her up: if the tiger be in an amorous mood he will pair with her; if not he will eat her up, and this casualty is of frequent occurrence.

29

Locality will differentiate habits also: for instance, rugged highlands will not produce the same results as the soft lowlands. The animals of the highlands look fiercer and bolder, as is seen in the swine of Mount Athos; for a lowland boar is no match even for a mountain sow.

Again, locality is an important element in regard to the bite of an animal. Thus, in Pharos and other places, the bite of the scorpion is not dangerous; elsewhere – in Caria, for instances – where scorpions are venomous as well as plentiful and of large size, the sting is fatal to man or beast, even to the pig, and especially to a black pig, though the pig, by the way, is in general most singularly indifferent to the bite of any other creature. If a pig goes into water after being struck by the scorpion of Caria, it will surely die.

There is great variety in the effects produced by the bites of serpents. The asp is found in Libya; the so-called 'septic' drug is made from the body of the animal, and is the only remedy known for the bite of the original. Among the silphium, also, a snake is found, for the bite or which a certain stone is said to be a cure: a stone that is brought from the grave of an ancient king, which stone is put into water and drunk off. In certain parts of Italy the bite of the gecko is fatal. But the deadliest of all bites of venomous creatures is when one venomous animal has bitten another; as, for instance, a viper's after it has bitten a scorpion. To the great majority of such creatures man's is fatal. There is a very little snake, by some entitled the 'holy-snake', which is dreaded by even the largest serpents. It is about an ell long, and hairy-looking; whenever it bites an animal, the flesh all round the wound will at once mortify. There is in India a small snake which is exceptional in this respect, that for its bite no specific whatever is known.

30

Animals also vary as to their condition of health in connexion with their pregnancy.

Testaceans, such as scallops and all the oyster-family, and crustaceans, such as the lobster family, are best when with spawn. Even in the case of the testacean we speak of spawning (or pregnancy); but whereas the crustaceans may be seen coupling and laying their spawn, this is never the case with testaceans. Molluscs are best in the breeding time, as the calamary, the sepia, and the octopus.

Fishes, when they begin to breed, are nearly all good for the table; but after the female has gone long with spawn they are good in some cases, and in others are out of season. The maenis, for instance, is good at the breeding time. The female of this fish is round, the male longer and flatter; when the female is beginning to breed the male turns black and mottled, and is quite unfit for the table; at this period he is nicknamed the 'goat'.

The wrasses called the owzel and the thrush, and the smaris have different colours at different seasons, as is the case with the plumage of certain birds; that is to say, they become black in the spring and after the spring get white again. The phycis also changes its hue: in general it is white, but in spring it is mottled; it is the only sea-fish which is said make a bed for itself, and the female lays her spawn in this bed or nest. The maenis, as was observed, changes its colour as does the smaris, and in summer-time changes back from whitish to black, the change being especially marked about the fins and gills. The coracine, like the maenis, is in best condition at breeding time; the mullet, the basse, and scaly fishes in general are in bad condition at this period. A few fish are in much the same condition at all times, whether with spawn or not, as the glaucus. Old fishes also are bad eating; the old tunny is unfit even for pickling, as a great part of its flesh wastes away with age, and the same wasting is observed in all old fishes. The age of a scaly fish may be told by the size and the hardness of its

scales. An old tunny has been caught weighing fifteen talents, with the span of its tail two cubits and a palm broad.

River-fish and lake-fish are best after they have discharged the spawn in the case of the female and the milt in the case of the male: that is, when they have fully recovered from the exhaustion of such discharge. Some are good in the breeding time, as the saperdis, and some bad, as the sheat-fish. As a general rule, the male fish is better eating than the female; but the reverse holds good of the sheat-fish. The eels that are called females are the best for the table: they look as though they were female, but they really are not so.

Book IX

1

Of the animals that are comparatively obscure and short-lived the characters or dispositions are not so obvious to recognition as are those of animals that are longer-lived. These latter animals appear to have a natural capacity corresponding to each of the passions: to cunning or simplicity, courage or timidity, to good temper or to bad, and to other similar dispositions of mind.

Some also are capable of giving or receiving instruction – of receiving it from one another or from man: those that have the faculty of hearing, for instance; and, not to limit the matter to

audible sound, such as can differentiate the suggested meanings of word and gesture.

In all genera in which the distinction of male and female is found, Nature makes a similar differentiation in the mental characteristics of the two sexes. This differentiation is the most obvious in the case of human kind and in that of the larger animals and the viviparous quadrupeds. In the case of these latter the female softer in character, is the sooner tamed, admits more readily of caressing, is more apt in the way of learning; as, for instance, in the Laconian breed of dogs the female is cleverer than the male. Of the Molossian breed of dogs, such as are employed in the chase are pretty much the same as those elsewhere; but sheep-dogs of this breed are superior to the others in size, and in the courage with which they face the attacks of wild animals.

Dogs that are born of a mixed breed between these two kinds are remarkable for courage and endurance of hard labour.

In all cases, excepting those of the bear and leopard, the female is less spirited than the male; in regard to the two exceptional cases, the superiority in courage rests with the female. With all other animals the female is softer in disposition than the male, is more mischievous, less simple, more impulsive, and more attentive to the nurture of the young: the male, on the other hand, is more spirited than the female, more savage, more simple and less cunning. The traces of these differentiated characteristics are more or less visible everywhere, but they are especially visible where character is the more developed, and most of all in man.

The fact is, the nature of man is the most rounded off and complete, and consequently in man the qualities or capacities above referred to are found in their perfection. Hence woman is more compassionate than man, more easily moved to tears, at

the same time is more jealous, more querulous, more apt to scold and to strike. She is, furthermore, more prone to despondency and less hopeful than the man, more void of shame or self-respect, more false of speech, more deceptive, and of more retentive memory. She is also more wakeful, more shrinking, more difficult to rouse to action, and requires a smaller quantity of nutriment.

As was previously stated, the male is more courageous than the female, and more sympathetic in the way of standing by to help. Even in the case of molluscs, when the cuttle-fish is struck with the trident the male stands by to help the female; but when the male is struck the female runs away.

There is enmity between such animals as dwell in the same localities or subsist on the food. If the means of subsistence run short, creatures of like kind will fight together. Thus it is said that seals which inhabit one and the same district will fight, male with male, and female with female, until one combatant kills the other, or one is driven away by the other; and their young do even in like manner.

All creatures are at enmity with the carnivores, and the carnivores with all the rest, for they all subsist on living creatures. Soothsayers take notice of cases where animals keep apart from one another, and cases where they congregate together; calling those that live at war with one another 'dissociates', and those that dwell in peace with one another 'associates'. One may go so far as to say that if there were no lack or stint of food, then those animals that are now afraid of man or are wild by nature would be tame and familiar with him, and in like manner with one another. This is shown by the way animals are treated in Egypt, for owing to the fact that food is constantly supplied to them the very fiercest creatures live peaceably together. The fact is they are tamed by kindness, and

in some places crocodiles are tame to their priestly keeper from being fed by him. And elsewhere also the same phenomenon is to be observed.

The eagle and the snake are enemies, for the eagle lives on snakes; so are the ichneumon and the venom-spider, for the ichneumon preys upon the latter. In the case of birds, there is mutual enmity between the poecilis, the crested lark, the woodpecker (?), and the chloreus, for they devour one another's eggs; so also between the crow and the owl; for, owing to the fact that the owl is dim-sighted by day, the crow at midday preys upon the owl's eggs, and the owl at night upon the crow's, each having the whip-hand of the other, turn and turn about, night and day.

There is enmity also between the owl and the wren; for the latter also devours the owl's eggs. In the daytime all other little birds flutter round the owl – a practice which is popularly termed 'admiring him' – buffet him, and pluck out his feathers; in consequence of this habit, bird-catchers use the owl as a decoy for catching little birds of all kinds.

The so-called presbys or 'old man' is at war with the weasel and the crow, for they prey on her eggs and her brood; and so the turtle-dove with the pyrallis, for they live in the same districts and on the same food; and so with the green wood pecker and the libyus; and so with kite and the raven, for, owing to his having the advantage from stronger talons and more rapid flight the former can steal whatever the latter is holding, so that it is food also that makes enemies of these. In like manner there is war between birds that get their living from the sea, as between the brenthus, the gull, and the harpe; and so between the buzzard on one side and the toad and snake on the other, for the buzzard preys upon the eggs of the two others; and so

between the turtle-dove and the chloreus; the chloreus kills the dove, and the crow kills the so-called drummer-bird.

The aegolius, and birds of prey in general, prey upon the calaris, and consequently there is war between it and them; and so is there war between the gecko-lizard and the spider, for the former preys upon the latter; and so between the woodpecker and the heron, for the former preys upon the eggs and brood of the latter. And so between the aegithus and the ass, owing to the fact that the ass, in passing a furze-bush, rubs its sore and itching parts against the prickles; by so doing, and all the more if it brays, it topples the eggs and the brood out of the nest, the young ones tumble out in fright, and the mother-bird, to avenge this wrong, flies at the beast and pecks at his sore places.

The wolf is at war with the ass, the bull, and the fox, for as being a carnivore, he attacks these other animals; and so for the same reason with the fox and the circus, for the circus, being carnivorous and furnished with crooked talons, attacks and maims the animal. And so the raven is at war with the bull and the ass, for it flies at them, and strikes them, and pecks at their eyes; and so with the eagle and the heron, for the former, having crooked talons, attacks the latter, and the latter usually succumbs to the attack; and so the merlin with the vulture; and the crex with the eleus-owl, the blackbird, and the oriole (of this latter bird, by the way, the story goes that he was originally born out of a funeral pyre): the cause of warfare is that the crex injures both them and their young. The nuthatch and the wren are at war with the eagle; the nuthatch breaks the eagle's eggs, so the eagle is at war with it on special grounds, though, as a bird of prey, it carries on a general war all round. The horse and the anthus are enemies, and the horse will drive the bird out of the field where he is grazing: the bird feeds on grass, and sees too dimly to foresee an attack; it mimics the whinnying of the horse, flies at him, and tries to frighten him away; but the horse

drives the bird away, and whenever he catches it he kills it: this bird lives beside rivers or on marsh ground; it has pretty plumage, and finds its without trouble. The ass is at enmity with the lizard, for the lizard sleeps in his manger, gets into his nostril, and prevents his eating.

Of herons there are three kinds: the ash coloured, the white, and the starry heron (or bittern). Of these the first mentioned submits with reluctance to the duties of incubation, or to union of the sexes; in fact, it screams during the union, and it is said drips blood from its eyes; it lays its eggs also in an awkward manner, not unattended with pain. It is at war with certain creatures that do it injury: with the eagle for robbing it, with the fox for worrying it at night, and with the lark for stealing its eggs.

The snake is at war with the weasel and the pig; with the weasel when they are both at home, for they live on the same food; with the pig for preying on her kind. The merlin is at war with the fox; it strikes and claws it, and, as it has crooked talons, it kills the animal's young. The raven and the fox are good friends, for the raven is at enmity with the merlin; and so when the merlin assails the fox the raven comes and helps the animal. The vulture and the merlin are mutual enemies, as being both furnished with crooked talons. The vulture fights with the eagle, and so, by the way, does does swan; and the swan is often victorious: moreover, of all birds swans are most prone to the killing of one another.

In regard to wild creatures, some sets are at enmity with other sets at all times and under all circumstances; others, as in the case of man and man, at special times and under incidental circumstances. The ass and the acanthis are enemies; for the bird lives on thistles, and the ass browses on thistles when they are young and tender. The anthus, the acanthis, and the

aegithus are at enmity with one another; it is said that the blood of the anthus will not intercommingle with the blood of the aegithus. The crow and the heron are friends, as also are the sedge-bird and lark, the laedus and the celeus or green woodpecker; the woodpecker lives on the banks of rivers and beside brakes, the laedus lives on rocks and bills, and is greatly attached to its nesting-place. The piphinx, the harpe, and the kite are friends; as are the fox and the snake, for both burrow underground; so also are the blackbird and the turtle-dove. The lion and the thos or civet are enemies, for both are carnivorous and live on the same food. Elephants fight fiercely with one another, and stab one another with their tusks; of two combatants the beaten one gets completely cowed, and dreads the sound of his conqueror's voice. These animals differ from one another an extraordinary extent in the way of courage. Indians employ these animals for war purposes, irrespective of sex; the females, however, are less in size and much inferior in point of spirit. An elephant by pushing with his big tusks can batter down a wall, and will butt with his forehead at a palm until he brings it down, when he stamps on it and lays it in orderly fashion on the ground. Men hunt the elephant in the following way: they mount tame elephants of approved spirit and proceed in quest of wild animals; when they come up with these they bid the tame brutes to beat the wild ones until they tire the latter completely. Hereupon the driver mounts a wild brute and guides him with the application of his metal prong; after this the creature soon becomes tame, and obeys guidance. Now when the driver is on their back they are all tractable, but after he has dismounted, some are tame and others vicious; in the case of these latter, they tie their front-legs with ropes to keep them quiet. The animal is hunted whether young or full grown.

Thus we see that in the case of the creatures above mentioned their mutual friendship or the is due to the food they feed on and the life they lead.

2

Of fishes, such as swim in shoals together are friendly to one another; such as do not so swim are enemies. Some fishes swarm during the spawning season; others after they have spawned. To state the matter comprehensively, we may say that the following are shoaling fish: the tunny, the maenis, the sea-gudgeon, the bogue, the horse-mackerel, the coracine, the synodon or dentex, the red mullet, the sphyraena, the anthias, the eleginus, the atherine, the sarginus, the gar-fish, (the squid,) the rainbow-wrasse, the pelamyd, the mackerel, the coly-mackerel. Of these some not only swim in shoals, but go in pairs inside the shoal; the rest without exception swim in pairs, and only swim in shoals at certain periods: that is, as has been said, when they are heavy with spawn or after they have spawned.

The basse and the grey mullet are bitter enemies, but they swarm together at certain times; for at times not only do fishes of the same species swarm together, but also those whose feeding-grounds are identical or adjacent, if the food-supply be abundant. The grey mullet is often found alive with its tail lopped off, and the conger with all that part of its body removed that lies to the rear of the vent; in the case of the mullet the injury is wrought by the basse, in that of the conger-eel by the muraena. There is war between the larger and the lesser fishes: for the big fishes prey on the little ones. So much on the subject of marine animals.

3

The characters of animals, as has been observed, differ in respect to timidity, to gentleness, to courage, to tameness, to intelligence, and to stupidity.

The sheep is said to be naturally dull and stupid. Of all quadrupeds it is the most foolish: it will saunter away to lonely places with no object in view; oftentimes in stormy weather it will stray from shelter; if it be overtaken by a snowstorm, it will stand still unless the shepherd sets it in motion; it will stay behind and perish unless the shepherd brings up the rams; it will then follow home.

If you catch hold of a goat’s beard at the extremity – the beard is of a substance resembling hair – all the companion goats will stand stock still, staring at this particular goat in a kind of dumbfounderment.

You will have a warmer bed in amongst the goats than among the sheep, because the goats will be quieter and will creep up towards you; for the goat is more impatient of cold than the sheep.

Shepherds train sheep to close in together at a clap of their hands, for if, when a thunderstorm comes on, a ewe stays behind without closing in, the storm will kill it if it be with young; consequently if a sudden clap or noise is made, they close in together within the sheepfold by reason of their training.

Even bulls, when they are roaming by themselves apart from the herd, are killed by wild animals.

Sheep and goats lie crowded together, kin by kin. When the sun turns early towards its setting, the goats are said to lie no longer face to face, but back to back.

4

Cattle at pasture keep together in their accustomed herds, and if one animal strays away the rest will follow; consequently if the herdsmen lose one particular animal, they keep close watch on all the rest.

When mares with their colts pasture together in the same field, if one dam dies the others will take up the rearing of the colt. In point of fact, the mare appears to be singularly prone by nature to maternal fondness; in proof whereof a barren mare will steal the foal from its dam, will tend it with all the solicitude of a mother, but, as it will be unprovided with mother's milk, its solicitude will prove fatal to its charge.

5

Among wild quadrupeds the hind appears to be pre-eminently intelligent; for example, in its habit of bringing forth its young on the sides of public roads, where the fear of man forbids the approach of wild animals. Again, after parturition, it first swallows the afterbirth, then goes in quest of the seseli shrub, and after eating of it returns to its young. The mother takes its young betimes to her lair, so leading it to know its place of refuge in time of danger; this lair is a precipitous rock, with only one approach, and there it is said to hold its own against all

comers. The male when it gets fat, which it does in a high degree in autumn, disappears, abandoning its usual resorts, apparently under an idea that its fatness facilitates its capture. They shed their horns in places difficult of access or discovery, whence the proverbial expression of 'the place where the stag sheds his horns'; the fact being that, as having parted with their weapons, they take care not to be seen. The saying is that no man has ever seen the animal's left horn; that the creature keeps it out of sight because it possesses some medicinal property.

In their first year stags grow no horns, but only an excrescence indicating where horns will be, this excrescence being short and thick. In their second year they grow their horns for the first time, straight in shape, like pegs for hanging clothes on; and on this account they have an appropriate nickname. In the third year the antlers are bifurcate; in the fourth year they grow trifurcate; and so they go on increasing in complexity until the creature is six years old: after this they grow their horns without any specific differentiation, so that you cannot by observation of them tell the animal's age. But the patriarchs of the herd may be told chiefly by two signs; in the first place they have few teeth or none at all, and, in the second place, they have ceased to grow the pointed tips to their antlers. The forward-pointing tips of the growing horns (that is to say the brow antlers), with which the animal meets attack, are technically termed its 'defenders'; with these the patriarchs are unprovided, and their antlers merely grow straight upwards. Stags shed their horns annually, in or about the month of May; after shedding, they conceal themselves, it is said, during the daytime, and, to avoid the flies, hide in thick copses; during this time, until they have grown their horns, they feed at night-time. The horns at first grow in a kind of skin envelope, and get rough by degrees; when they reach their full size the animal basks in the sun, to mature and dry them. When they need no longer rub

them against tree-trunks they quit their hiding places, from a sense of security based upon the possession of arms defensive and offensive. An Achaeine stag has been caught with a quantity of green ivy grown over its horns, it having grown apparently, as on fresh green wood, when the horns were young and tender. When a stag is stung by a venom-spider or similar insect, it gathers crabs and eats them; it is said to be a good thing for man to drink the juice, but the taste is disagreeable. The hinds after parturition at once swallow the afterbirth, and it is impossible to secure it, for the hind catches it before it falls to the ground: now this substance is supposed to have medicinal properties. When hunted the creatures are caught by singing or pipe-playing on the part of the hunters; they are so pleased with the music that they lie down on the grass. If there be two hunters, one before their eyes sings or plays the pipe, the other keeps out of sight and shoots, at a signal given by the confederate. If the animal has its ears cocked, it can hear well and you cannot escape its ken; if its ears are down, you can.

6

When bears are running away from their pursuers they push their cubs in front of them, or take them up and carry them; when they are being overtaken they climb up a tree. When emerging from their winter-den, they at once take to eating cuckoo-pint, as has been said, and chew sticks of wood as though they were cutting teeth.

Many other quadrupeds help themselves in clever ways. Wild goats in Crete are said, when wounded by arrows, to go in search of dittany, which is supposed to have the property of ejecting arrows in the body. Dogs, when they are ill, eat some

kind of grass and produce vomiting. The panther, after eating panther's-bane, tries to find some human excrement, which is said to heal its pain. This panther's-bane kills lions as well. Hunters hang up human excrement in a vessel attached to the boughs of a tree, to keep the animal from straying to any distance; the animal meets its end in leaping up to the branch and trying to get at the medicine. They say that the panther has found out that wild animals are fond of the scent it emits; that, when it goes a-hunting, it hides itself; that the other animals come nearer and nearer, and that by this stratagem it can catch even animals as swift of foot as stags.

The Egyptian ichneumon, when it sees the serpent called the asp, does not attack it until it has called in other ichneumons to help; to meet the blows and bites of their enemy the assailants beplaster themselves with mud, by first soaking in the river and then rolling on the ground.

When the crocodile yawns, the trochilus flies into his mouth and cleans his teeth. The trochilus gets his food thereby, and the crocodile gets ease and comfort; it makes no attempt to injure its little friend, but, when it wants it to go, it shakes its neck in warning, lest it should accidentally bite the bird.

The tortoise, when it has partaken of a snake, eats marjoram; this action has been actually observed. A man saw a tortoise perform this operation over and over again, and every time it plucked up some marjoram go back to partake of its prey; he thereupon pulled the marjoram up by the roots, and the consequence was the tortoise died. The weasel, when it fights with a snake, first eats wild rue, the smell of which is noxious to the snake. The dragon, when it eats fruit, swallows endive-juice; it has been seen in the act. Dogs, when they suffer from worms, eat the standing corn. Storks, and all other birds, when they get a wound fighting, apply marjoram to the place injured.

Many have seen the locust, when fighting with the snake get a tight hold of the snake by the neck. The weasel has a clever way of getting the better of birds; it tears their throats open, as wolves do with sheep. Weasels fight desperately with mice-catching snakes, as they both prey on the same animal.

In regard to the instinct of hedgehogs, it has been observed in many places that, when the wind is shifting from north to south, and from south to north, they shift the outlook of their earth-holes, and those that are kept in domestication shift over from one wall to the other. The story goes that a man in Byzantium got into high repute for foretelling a change of weather, all owing to his having noticed this habit of the hedgehog.

The polecat or marten is about as large as the smaller breed of Maltese dogs. In the thickness of its fur, in its look, in the white of its belly, and in its love of mischief, it resembles the weasel; it is easily tamed; from its liking for honey it is a plague to bee-hives; it preys on birds like the cat. Its genital organ, as has been said, consists of bone: the organ of the male is supposed to be a cure for strangury; doctors scrape it into powder, and administer it in that form.

7

In a general way in the lives of animals many resemblances to human life may be observed. Pre-eminent intelligence will be seen more in small creatures than in large ones, as is exemplified in the case of birds by the nest building of the swallow. In the same way as men do, the bird mixes mud and chaff together; if it runs short of mud, it souses its body in water and rolls about in the dry dust with wet feathers; furthermore,

just as man does, it makes a bed of straw, putting hard material below for a foundation, and adapting all to suit its own size. Both parents co-operate in the rearing of the young; each of the parents will detect, with practised eye, the young one that has had a helping, and will take care it is not helped twice over; at first the parents will rid the nest of excrement, but, when the young are grown, they will teach their young to shift their position and let their excrement fall over the side of the nest.

Pigeons exhibit other phenomena with a similar likeness to the ways of humankind. In pairing the same male and the same female keep together; and the union is only broken by the death of one of the two parties. At the time of parturition in the female the sympathetic attentions of the male are extraordinary; if the female is afraid on account of the impending parturition to enter the nest, the male will beat her and force her to come in. When the young are born, he will take and masticate pieces of suitable food, will open the beaks of the fledglings, and inject these pieces, thus preparing them betimes to take food. (When the male bird is about to expel the the young ones from the nest he cohabits with them all.) As a general rule these birds show this conjugal fidelity, but occasionally a female will cohabit with other than her mate. These birds are combative, and quarrel with one another, and enter each other's nests, though this occurs but seldom; at a distance from their nests this quarrelsomeness is less marked, but in the close neighbourhood of their nests they will fight desperately. A peculiarity common to the tame pigeon, the ring-dove and the turtle-dove is that they do not lean the head back when they are in the act of drinking, but only when they have fully quenched their thirst. The turtle-dove and the ring-dove both have but one mate, and let no other come nigh; both sexes co-operate in the process of incubation. It is difficult to distinguish between the sexes except by an examination of their interiors. Ring-doves are long-lived; cases have been

known where such birds were twenty-five years old, thirty years old, and in some cases forty. As they grow old their claws increase in size, and pigeon-fanciers cut the claws; as far as one can see, the birds suffer no other perceptible disfigurement by their increase in age. Turtle-doves and pigeons that are blinded by fanciers for use as decoys, live for eight years. Partridges live for about fifteen years. Ring-doves and turtle-doves always build their nests in the same place year after year. The male, as a general rule, is more long-lived than the female; but in the case of pigeons some assert that the male dies before the female, taking their inference from the statements of persons who keep decoy-birds in captivity. Some declare that the male sparrow lives only a year, pointing to the fact that early in spring the male sparrow has no black beard, but has one later on, as though the blackbearded birds of the last year had all died out; they also say that the females are the longer lived, on the grounds that they are caught in amongst the young birds and that their age is rendered manifest by the hardness about their beaks. Turtle-doves in summer live in cold places, (and in warm places during the winter); chaffinches affect warm habitations in summer and cold ones in winter.

8

Birds of a heavy build, such as quails, partridges, and the like, build no nests; indeed, where they are incapable of flight, it would be of no use if they could do so. After scraping a hole on a level piece of ground – and it is only in such a place that they lay their eggs – they cover it over with thorns and sticks for security against hawks and eagles, and there lay their eggs and hatch them; after the hatching is over, they at once lead the young out from the nest, as they are not able to fly afield for

food for them. Quails and partridges, like barn-door hens, when they go to rest, gather their brood under their wings. Not to be discovered, as might be the case if they stayed long in one spot, they do not hatch the eggs where they laid them. When a man comes by chance upon a young brood, and tries to catch them, the hen-bird rolls in front of the hunter, pretending to be lame: the man every moment thinks he is on the point of catching her, and so she draws him on and on, until every one of her brood has had time to escape; hereupon she returns to the nest and calls the young back. The partridge lays not less than ten eggs, and often lays as many as sixteen. As has been observed, the bird has mischievous and deceitful habits. In the spring-time, a noisy scrimmage takes place, out of which the male-birds emerge each with a hen. Owing to the lecherous nature of the bird, and from a dislike to the hen sitting, the males, if they find any eggs, roll them over and over until they break them in pieces; to provide against this the female goes to a distance and lays the eggs, and often, under the stress of parturition, lays them in any chance spot that offers; if the male be near at hand, then to keep the eggs intact she refrains from visiting them. If she be seen by a man, then, just as with her fledged brood, she entices him off by showing herself close at his feet until she has drawn him to a distance. When the females have run away and taken to sitting, the males in a pack take to screaming and fighting; when thus engaged, they have the nickname of 'widowers'. The bird who is beaten follows his victor, and submits to be covered by him only; and the beaten bird is covered by a second one or by any other, only clandestinely without the victor's knowledge; this is so, not at all times, but at a particular season of the year, and with quails as well as with partridges. A similar proceeding takes place occasionally with barn-door cocks: for in temples, where cocks are set apart as dedicate without hens, they all as a matter of course tread any new-comer. Tame partridges tread wild birds, pecket their

heads, and treat them with every possible outrage. The leader of the wild birds, with a counter-note of challenge, pushes forward to attack the decoy-bird, and after he has been netted, another advances with a similar note. This is what is done if the decoy be a male; but if it be a female that is the decoy and gives the note, and the leader of the wild birds give a counter one, the rest of the males set upon him and chase him away from the female for making advances to her instead of to them; in consequence of this the male often advances without uttering any cry, so that no other may hear him and come and give him battle; and experienced fowlers assert that sometimes the male bird, when he approaches the female, makes her keep silence, to avoid having to give battle to other males who might have heard him. The partridge has not only the note here referred to, but also a thin shrill cry and other notes. Oftentimes the hen-bird rises from off her brood when she sees the male showing attentions to the female decoy; she will give the counter note and remain still, so as to be trodden by him and divert him from the decoy. The quail and the partridge are so intent upon sexual union that they often come right in the way of the decoy-birds, and not seldom alight upon their heads. So much for the sexual proclivities of the partridge, for the way in which it is hunted, and the general nasty habits of the bird.

As has been said, quails and partridges build their nests upon the ground, and so also do some of the birds that are capable of sustained flight. Further, for instance, of such birds, the lark and the woodcock, as well as the quail, do not perch on a branch, but squat upon the ground.

9

The woodpecker does not squat on the ground, but pecks at the bark of trees to drive out from under it maggots and gnats; when they emerge, it licks them up with its tongue, which is large and flat. It can run up and down a tree in any way, even with the head downwards, like the gecko-lizard. For secure hold upon a tree, its claws are better adapted than those of the daw; it makes its way by sticking these claws into the bark. One species of woodpecker is smaller than a blackbird, and has small reddish speckles; a second species is larger than the blackbird, and a third is not much smaller than a barn-door hen. It builds a nest on trees, as has been said, on olive trees amongst others. It feeds on the maggots and ants that are under the bark: it is so eager in the search for maggots that it is said sometimes to hollow a tree out to its downfall. A woodpecker once, in course of domestication, was seen to insert an almond into a hole in a piece of timber, so that it might remain steady under its pecking; at the third peck it split the shell of the fruit, and then ate the kernel.

10

Many indications of high intelligence are given by cranes. They will fly to a great distance and up in the air, to command an extensive view; if they see clouds and signs of bad weather they fly down again and remain still. They, furthermore, have a leader in their flight, and patrols that scream on the confines of the flock so as to be heard by all. When they settle down, the main body go to sleep with their heads under their wing, standing first on one leg and then on the other, while their

leader, with his head uncovered, keeps a sharp look out, and when he sees anything of importance signals it with a cry.

Pelicans that live beside rivers swallow the large smooth mussel-shells: after cooking them inside the crop that precedes the stomach, they spit them out, so that, now when their shells are open, they may pick the flesh out and eat it.

11

Of wild birds, the nests are fashioned to meet the exigencies of existence and ensure the security of the young. Some of these birds are fond of their young and take great care of them, others are quite the reverse; some are clever in procuring subsistence, others are not so. Some of these birds build in ravines and clefts, and on cliffs, as, for instance, the so-called charadrius, or stone-curlew; this bird is in no way noteworthy for plumage or voice; it makes an appearance at night, but in the daytime keeps out of sight.

The hawk also builds in inaccessible places. Although a ravenous bird, it will never eat the heart of any bird it catches; this has been observed in the case of the quail, the thrush, and other birds. They modify betimes their method of hunting, for in summer they do not grab their prey as they do at other seasons.

Of the vulture, it is said that no one has ever seen either its young or its nest; on this account and on the ground that all of a sudden great numbers of them will appear without any one being able to tell from whence they come, Herodorus, the father of Bryson the sophist, says that it belongs to some distant and elevated land. The reason is that the bird has its nest on

inaccessible crags, and is found only in a few localities. The female lays one egg as a rule, and two at the most.

Some birds live on mountains or in forests, as the hoopoe and the brenthus; this latter bird finds his food with ease and has a musical voice. The wren lives in brakes and crevices; it is difficult of capture, keeps out of sight, is gentle of disposition, finds its food with ease, and is something of a mechanic. It goes by the nickname of 'old man' or 'king'; and the story goes that for this reason the eagle is at war with him.

12

Some birds live on the sea-shore, as the wagtail; the bird is of a mischievous nature, hard to capture, but when caught capable of complete domestication; it is a cripple, as being weak in its hinder quarters.

Web-footed birds without exception live near the sea or rivers or pools, as they naturally resort to places adapted to their structure. Several birds, however, with cloven toes live near pools or marshes, as, for instance, the anthus lives by the side of rivers; the plumage of this bird is pretty, and it finds its food with ease. The catarrhactes lives near the sea; when it makes a dive, it will keep under water for as long as it would take a man to walk a furlong; it is less than the common hawk. Swans are web-footed, and live near pools and marshes; they find their food with ease, are good-tempered, are fond of their young, and live to a green old age. If the eagle attacks them they will repel the attack and get the better of their assailant, but they are never the first to attack. They are musical, and sing chiefly at the approach of death; at this time they fly out to sea, and men, when sailing past the coast of Libya, have fallen in with many of

them out at sea singing in mournful strains, and have actually seen some of them dying.

The cymindis is seldom seen, as it lives on mountains; it is black in colour, and about the size of the hawk called the 'dove-killer'; it is long and slender in form. The Ionians call the bird by this name; Homer in the Iliad mentions it in the line:

Chalcis its name with those of heavenly birth,

But called Cymindis by the sons of earth.

The hybris, said by some to be the same as the eagle-owl, is never seen by daylight, as it is dim-sighted, but during the night it hunts like the eagle; it will fight the eagle with such desperation that the two combatants are often captured alive by shepherds; it lays two eggs, and, like others we have mentioned, it builds on rocks and in caverns. Cranes also fight so desperately among themselves as to be caught when fighting, for they will not leave off; the crane lays two eggs.

13

The jay has a great variety of notes: indeed, might almost say it had a different note for every day in the year. It lays about nine eggs; builds its nest on trees, out of hair and tags of wool; when acorns are getting scarce, it lays up a store of them in hiding.

It is a common story of the stork that the old birds are fed by their grateful progeny. Some tell a similar story of the bee-eater, and declare that the parents are fed by their young not only when growing old, but at an early period, as soon as the young are capable of feeding them; and the parent-birds stay inside the nest. The under part of the bird's wing is pale yellow; the

upper part is dark blue, like that of the halcyon; the tips of the wings are About autumn-time it lays six or seven eggs, in overhanging banks where the soil is soft; there it burrows into the ground to a depth of six feet.

The greenfinch, so called from the colour of its belly, is as large as a lark; it lays four or five eggs, builds its nest out of the plant called comfrey, pulling it up by the roots, and makes an under-mattress to lie on of hair and wool. The blackbird and the jay build their nests after the same fashion. The nest of the penduline tit shows great mechanical skill; it has the appearance of a ball of flax, and the hole for entry is very small.

People who live where the bird comes from say that there exists a cinnamon bird which brings the cinnamon from some unknown localities, and builds its nest out of it; it builds on high trees on the slender top branches. They say that the inhabitants attach leaden weights to the tips of their arrows and therewith bring down the nests, and from the intertexture collect the cinnamon sticks.

14

The halcyon is not much larger than the sparrow. Its colour is dark blue, green, and light purple; the whole body and wings, and especially parts about the neck, show these colours in a mixed way, without any colour being sharply defined; the beak is light green, long and slender: such, then, is the look of the bird. Its nest is like sea-balls, i.e. the things that by the name of halosachne or seafoam, only the colour is not the same. The colour of the nest is light red, and the shape is that of the long-necked gourd. The nests are larger than the largest sponge, though they vary in size; they are roofed over, and great part of

them is solid and great part hollow. If you use a sharp knife it is not easy to cut the nest through; but if you cut it, and at the same time bruise it with your hand, it will soon crumble to pieces, like the halosachne. The opening is small, just enough for a tiny entrance, so that even if the nest upset the sea does not enter in; the hollow channels are like those in sponges. It is not known for certain of what material the nest is constructed; it is possibly made of the backbones of the gar-fish; for, by the way, the bird lives on fish. Besides living on the shore, it ascends fresh-water streams. It lays generally about five eggs, and lays eggs all its life long, beginning to do so at the age of four months.

15

The hoopoe usually constructs its nest out of human excrement. It changes its appearance in summer and in winter, as in fact do the great majority of wild birds. (The titmouse is said to lay a very large quantity of eggs: next to the ostrich the blackheaded tit is said by some to lay the largest number of eggs; seventeen eggs have been seen; it lays, however, more than twenty; it is said always to lay an odd number. Like others we have mentioned, it builds in trees; it feeds on caterpillars.) A peculiarity of this bird and of the nightingale is that the outer extremity of the tongue is not sharp-pointed.

The aegithus finds its food with ease, has many young, and walks with a limp. The golden oriole is apt at learning, is clever at making a living, but is awkward in flight and has an ugly plumage.

16

The reed-warbler makes its living as easily as any other bird, sits in summer in a shady spot facing the wind, in winter in a sunny and sheltered place among reeds in a marsh; it is small in size, with a pleasant note. The so-called chatterer has a pleasant note, beautiful plumage, makes a living cleverly, and is graceful in form; it appears to be alien to our country; at all events it is seldom seen at a distance from its own immediate home.

17

The crake is quarrelsome, clever at making a living, but in other ways an unlucky bird. The bird called sitta is quarrelsome, but clever and tidy, makes its living with ease, and for its knowingness is regarded as uncanny; it has a numerous brood, of which it is fond, and lives by pecking the bark of trees. The aegolius-owl flies by night, is seldom seen by day; like others we have mentioned, it lives on cliffs or in caverns; it feeds on two kinds of food; it has a strong hold on life and is full of resource. The tree-creeper is a little bird, of fearless disposition; it lives among trees, feeds on caterpillars, makes a living with ease, and has a loud clear note. The acanthis finds its food with difficulty; its plumage is poor, but its note is musical.

18

Of the herons, the ashen-coloured one, as has been said, unites with the female not without pain; it is full of resource, carries its food with it, is eager in the quest of it, and works by day; its plumage is poor, and its excrement is always wet. Of the other two species – for there are three in all – the white heron has handsome plumage, unites without harm to itself with the female, builds a nest and lays its eggs neatly in trees; it frequents marshes and lakes and Plains and meadow land. The speckled heron, which is nicknamed ‘the skulker’, is said in folklore stories to be of servile origin, and, as its nickname implies, it is the laziest bird of the three species. Such are the habits of herons. The bird that is called the poynx has this peculiarity, that it is more prone than any other bird to peck at the eyes of an assailant or its prey; it is at war with the harpy, as the two birds live on the same food.

19

There are two kinds of owsels; the one is black, and is found everywhere, the other is quite white, about the same size as the other, and with the same pipe. This latter is found on Cyllene in Arcadia, and is found nowhere else. The laius, or blue-thrush, is like the black owsel, only a little smaller; it lives on cliffs or on tile roofings; it has not a red beak as the black owsel has.

20

Of thrushes there are three species. One is the misselthrush; it feeds only on mistletoe and resin; it is about the size of the jay. A second is the song-thrush; it has a sharp pipe, and is about the size of the owsel. There is another species called the Illas; it is the smallest species of the three, and is less variegated in plumage than the others.

21

There is a bird that lives on rocks, called the blue-bird from its colour. It is comparatively common in Nisyros, and is somewhat less than the owsel and a little bigger than the chaffinch. It has large claws, and climbs on the face of the rocks. It is steel-blue all over; its beak is long and slender; its legs are short, like those of the woodpecker.

22

The oriole is yellow all over; it is not visible during winter, but puts in an appearance about the time of the summer solstice, and departs again at the rising of Arcturus; it is the size of the turtle-dove. The so-called soft-head (or shrike) always settles on one and the same branch, where it falls a prey to the birdcatcher. Its head is big, and composed of gristle; it is a little smaller than the thrush; its beak is strong, small, and round; it is ashen-coloured all over; is fleet of foot, but slow of wing. The bird-catcher usually catches it by help of the owl.

23

There is also the pardalus. As a rule, it is seen in flocks and not singly; it is ashen-coloured all over, and about the size of the birds last described; it is fleet of foot and strong of wing, and its pipe is loud and high-pitched. The collyrion (or fieldfare) feeds on the same food as the owsel; is of the same size as the above mentioned birds; and is trapped usually in the winter. All these birds are found at all times. Further, there are the birds that live as a rule in towns, the raven and the crow. These also are visible at all seasons, never shift their place of abode, and never go into winter quarters.

24

Of daws there are three species. One is the chough; it is as large as the crow, but has a red beak. There is another, called the 'wolf'; and further there is the little daw, called the 'railer'. There is another kind of daw found in Lybia and Phrygia, which is web-footed.

25

Of larks there are two kinds. One lives on the ground and has a crest on its head; the other is gregarious, and not sporadic like

the first; it is, however, of the same coloured plumage, but is smaller, and has no crest; it is an article of human food.

26

The woodcock is caught with nets in gardens. It is about the size of a barn-door hen; it has a long beak, and in plumage is like the francolin-partridge. It runs quickly, and is pretty easily domesticated. The starling is speckled; it is of the same size as the owsel.

27

Of the Egyptian ibis there are two kinds, the white and the black. The white ones are found over Egypt, excepting in Pelusium; the black ones are found in Pelusium, and nowhere else in Egypt.

28

Of the little horned owls there are two kinds, and one is visible at all seasons, and for that reason has the nickname of ‘all-the-year-round owl’; it is not sufficiently palatable to come to table; another species makes its appearance sometimes in the autumn, is seen for a single day or at the most for two days, and is regarded as a table delicacy; it scarcely differs from the first species save only in being fatter; it has no note, but the other

species has. With regard to their origin, nothing is known from ocular observation; the only fact known for certain is that they are first seen when a west wind is blowing.

29

The cuckoo, as has been said elsewhere, makes no nest, but deposits its eggs in an alien nest, generally in the nest of the ring-dove, or on the ground in the nest of the hypolais or lark, or on a tree in the nest of the green linnet. it lays only one egg and does not hatch it itself, but the mother-bird in whose nest it has deposited it hatches and rears it; and, as they say, this mother bird, when the young cuckoo has grown big, thrusts her own brood out of the nest and lets them perish; others say that this mother-bird kills her own brood and gives them to the alien to devour, despising her own young owing to the beauty of the cuckoo. Personal observers agree in telling most of these stories, but are not in agreement as to the instruction of the young. Some say that the mother-cuckoo comes and devours the brood of the rearing mother; others say that the young cuckoo from its superior size snaps up the food brought before the smaller brood have a chance, and that in consequence the smaller brood die of hunger; others say that, by its superior strength, it actually kills the other ones whilst it is being reared up with them. The cuckoo shows great sagacity in the disposal of its progeny; the fact is, the mother cuckoo is quite conscious of her own cowardice and of the fact that she could never help her young one in an emergency, and so, for the security of the young one, she makes of him a supposititious child in an alien nest. The truth is, this bird is pre-eminent among birds in the way of cowardice; it allows itself to be pecked at by little birds, and flies away from their attacks.

30

It has already been stated that the footless bird, which some term the cypselus, resembles the swallow; indeed, it is not easy to distinguish between the two birds, excepting in the fact that the cypselus has feathers on the shank. These birds rear their young in long cells made of mud, and furnished with a hole just big enough for entry and exit; they build under cover of some roofing – under a rock or in a cavern – for protection against animals and men.

The so-called goat-sucker lives on mountains; it is a little larger than the owsel, and less than the cuckoo; it lays two eggs, or three at the most, and is of a sluggish disposition. It flies up to the she-goat and sucks its milk, from which habit it derives its name; it is said that, after it has sucked the teat of the animal, the teat dries up and the animal goes blind. It is dim-sighted in the day-time, but sees well enough by night.

31

In narrow circumscribed districts where the food would be insufficient for more birds than two, ravens are only found in isolated pairs; when their young are old enough to fly, the parent couple first eject them from the nest, and by and by chase them from the neighbourhood. The raven lays four or five eggs. About the time when the mercenaries under Medius were slaughtered at Pharsalus, the districts about Athens and the Peloponnese were left destitute of ravens, from which it would

appear that these birds have some means of intercommunicating with one another.

32

Of eagles there are several species. One of them, called 'the white-tailed eagle', is found on low lands, in groves, and in the neighbourhood of cities; some call it the 'heron-killer'. It is bold enough to fly to mountains and the interior of forests. The other eagles seldom visit groves or low-lying land. There is another species called the 'plangus'; it ranks second in point of size and strength; it lives in mountain combes and glens, and by marshy lakes, and goes by the name of 'duck-killer' and 'swart-eagle.' It is mentioned by Homer in his account of the visit made by Priam to the tent of Achilles. There is another species with black Plumage, the smallest but boldest of all the kinds. It dwells on mountains or in forests, and is called 'the black-eagle' or 'the hare-killer'; it is the only eagle that rears its young and thoroughly takes them out with it. It is swift of flight, is neat and tidy in its habits, too proud for jealousy, fearless, quarrelsome; it is also silent, for it neither whimpers nor screams. There is another species, the percnopterus, very large, with white head, very short wings, long tail-feathers, in appearance like a vulture. It goes by the name of 'mountain-stork' or 'half-eagle'. It lives in groves; has all the bad qualities of the other species, and none of the good ones; for it lets itself be chased and caught by the raven and the other birds. It is clumsy in its movements, has difficulty in procuring its food, preys on dead animals, is always hungry, and at all times whining and screaming. There is another species, called the 'sea-eagle' or 'osprey'. This bird has a large thick neck, curved wings, and broad tailfeathers; it lives near the sea, grasps its

prey with its talons, and often, from inability to carry it, tumbles down into the water. There is another species called the 'true-bred'; people say that these are the only true-bred birds to be found, that all other birds – eagles, hawks, and the smallest birds – are all spoilt by the interbreeding of different species. The true-bred eagle is the largest of all eagles; it is larger than the phene; is half as large again as the ordinary eagle, and has yellow plumage; it is seldom seen, as is the case with the so-called cymindis. The time for an eagle to be on the wing in search of prey is from midday to evening; in the morning until the market-hour it remains on the nest. In old age the upper beak of the eagle grows gradually longer and more crooked, and the bird dies eventually of starvation; there is a folklore story that the eagle is thus punished because it once was a man and refused entertainment to a stranger. The eagle puts aside its superfluous food for its young; for owing to the difficulty in procuring food day by day, it at times may come back to the nest with nothing. If it catch a man prowling about in the neighbourhood of its nest, it will strike him with its wings and scratch him with its talons. The nest is built not on low ground but on an elevated spot, generally on an inaccessible ledge of a cliff; it does, however, build upon a tree. The young are fed until they can fly; hereupon the parent-birds topple them out of the nest, and chase them completely out of the locality. The fact is that a pair of eagles demands an extensive space for its maintenance, and consequently cannot allow other birds to quarter themselves in close neighbourhood. They do not hunt in the vicinity of their nest, but go to a great distance to find their prey. When the eagle has captured a beast, it puts it down without attempting to carry it off at once; if on trial it finds the burden too heavy, it will leave it. When it has spied a hare, it does not swoop on it at once, but lets it go on into the open ground; neither does it descend to the ground at one swoop, but goes gradually down from higher flights to lower and lower:

these devices it adopts by way of security against the stratagem of the hunter. It alights on high places by reason of the difficulty it experiences in soaring up from the level ground; it flies high in the air to have the more extensive view; from its high flight it is said to be the only bird that resembles the gods. Birds of prey, as a rule, seldom alight upon rock, as the crookedness of their talons prevents a stable footing on hard stone. The eagle hunts hares, fawns, foxes, and in general all such animals as he can master with ease. It is a long-lived bird, and this fact might be inferred from the length of time during which the same nest is maintained in its place.

33

In Scythia there is found a bird as large as the great bustard. The female lays two eggs, but does not hatch them, but hides them in the skin of a hare or fox and leaves them there, and, when it is not in quest of prey, it keeps a watch on them on a high tree; if any man tries to climb the tree, it fights and strikes him with its wing, just as eagles do.

34

The owl and the night-raven and all the birds see poorly in the daytime seek their prey in the night, but not all the night through, but at evening and dawn. Their food consists of mice, lizards, chafers and the like little creatures. The so-called phene, or lammergeier, is fond of its young, provides its food with ease, fetches food to its nest, and is of a kindly disposition. It rears its

own young and those of the eagle as well; for when the eagle ejects its young from the nest, this bird catches them up as they fall and feeds them. For the eagle, by the way, ejects the young birds prematurely, before they are able to feed themselves, or to fly. It appears to do so from jealousy; for it is by nature jealous, and is so ravenous as to grab furiously at its food; and when it does grab at its food, it grabs it in large morsels. It is accordingly jealous of the young birds as they approach maturity, since they are getting good appetites, and so it scratches them with its talons. The young birds fight also with one another, to secure a morsel of food or a comfortable position, whereupon the mother-bird beats them and ejects them from the nest; the young ones scream at this treatment, and the phene hearing them catches them as they fall. The phene has a film over its eyes and sees badly, but the sea-eagle is very keen-sighted, and before its young are fledged tries to make them stare at the sun, and beats the one that refuses to do so, and twists him back in the sun's direction; and if one of them gets watery eyes in the process, it kills him, and rears the other. It lives near the sea, and feeds, as has been said, on sea-birds; when in pursuit of them it catches them one by one, watching the moment when the bird rises to the surface from its dive. When a sea-bird, emerging from the water, sees the sea-eagle, he in terror dives under, intending to rise again elsewhere; the eagle, however, owing to its keenness of vision, keeps flying after him until he either drowns the bird or catches him on the surface. The eagle never attacks these birds when they are in a swarm, for they keep him off by raising a shower of water-drops with their wings.

35

The cepphus is caught by means of sea-foam; the bird snaps at the foam, and consequently fishermen catch it by sluicing with showers of sea-water. These birds grow to be plump and fat; their flesh has a good odour, excepting the hinder quarters, which smell of shoreweed.

36

Of hawks, the strongest is the buzzard; the next in point of courage is the merlin; and the circus ranks third; other diverse kinds are the asterias, the pigeon-hawk, and the pternis; the broaded-winged hawk is called the half-buzzard; others go by the name of hobby-hawk, or sparrow-hawk, or 'smooth-feathered', or 'toad-catcher'. Birds of this latter species find their food with very little difficulty, and flutter along the ground. Some say that there are ten species of hawks, all differing from one another. One hawk, they say, will strike and grab the pigeon as it rests on the ground, but never touch it while it is in flight; another hawk attacks the pigeon when it is perched upon a tree or any elevation, but never touches it when it is on the ground or on the wing; other hawks attack their prey only when it is on the wing. They say that pigeons can distinguish the various species: so that, when a hawk is an assailant, if it be one that attacks its prey when the prey is on the wing, the pigeon will sit still; if it be one that attacks sitting prey, the pigeon will rise up and fly away.

In Thrace, in the district sometimes called that of Cedripolis, men hunt for little birds in the marshes with the aid of hawks. The men with sticks in their hands go beating at the reeds and brushwood to frighten the birds out, and the hawks show

themselves overhead and frighten them down. The men then strike them with their sticks and capture them. They give a portion of their booty to the hawks; that is, they throw some of the birds up in the air, and the hawks catch them.

In the neighbourhood of Lake Maeotis, it is said, wolves act in concert with the fishermen, and if the fishermen decline to share with them, they tear their nets in pieces as they lie drying on the shore of the lake.

37

So much for the habits of birds.

In marine creatures, also, one In marine creatures, also, one may observe many ingenious devices adapted to the circumstances of their lives. For the accounts commonly given of the so-called fishing-frog are quite true; as are also those given of the torpedo. The fishing-frog has a set of filaments that project in front of its eyes; they are long and thin like hairs, and are round at the tips; they lie on either side, and are used as baits. Accordingly, when the animal stirs up a place full of sand and mud and conceals itself therein, it raises the filaments, and, when the little fish strike against them, it draws them in underneath into its mouth. The torpedo narcotizes the creatures that it wants to catch, overpowering them by the power of shock that is resident in its body, and feeds upon them; it also hides in the sand and mud, and catches all the creatures that swim in its way and come under its narcotizing influence. This phenomenon has been actually observed in operation. The sting-ray also conceals itself, but not exactly in the same way. That the creatures get their living by this means is obvious from the fact that, whereas they are peculiarly

inactive, they are often caught with mullets in their interior, the swiftest of fishes. Furthermore, the fishing-frog is unusually thin when he is caught after losing the tips of his filaments, and the torpedo is known to cause a numbness even in human beings. Again, the hake, the ray, the flat-fish, and the angelfish burrow in the sand, and after concealing themselves angle with the filaments on their mouths, that fishermen call their fishing-rods, and the little creatures on which they feed swim up to the filaments taking them for bits of sea-weed, such as they feed upon.

Wherever an anthias-fish is seen, there will be no dangerous creatures in the vicinity, and sponge-divers will dive in security, and they call these signal-fishes 'holy-fish'. It is a sort of perpetual coincidence, like the fact that wherever snails are present you may be sure there is neither pig nor partridge in the neighbourhood; for both pig and partridge eat up the snails.

The sea-serpent resembles the conger in colour and shape, but is of lesser bulk and more rapid in its movements. If it be caught and thrown away, it will bore a hole with its snout and burrow rapidly in the sand; its snout, by the way, is sharper than that of ordinary serpents. The so-called sea-scolopendra, after swallowing the hook, turns itself inside out until it ejects it, and then it again turns itself outside in. The sea-scolopendra, like the land-scolopendra, will come to a savoury bait; the creature does not bite with its teeth, but stings by contact with its entire body, like the so-called sea-nettle. The so-called fox-shark, when it finds it has swallowed the hook, tries to get rid of it as the scolopendra does, but not in the same way; in other words, it runs up the fishing-line, and bites it off short; it is caught in some districts in deep and rapid waters, with night-lines.

The bonitos swarm together when they espy a dangerous creature, and the largest of them swim round it, and if it

touches one of the shoal they try to repel it; they have strong teeth. Amongst other large fish, a lamia-shark, after falling in amongst a shoal, has been seen to be covered with wounds.

Of river-fish, the male of the sheat-fish is remarkably attentive to the young. The female after parturition goes away; the male stays and keeps on guard where the spawn is most abundant, contenting himself with keeping off all other little fishes that might steal the spawn or fry, and this he does for forty or fifty days, until the young are sufficiently grown to make away from the other fishes for themselves. The fishermen can tell where he is on guard: for, in warding off the little fishes, he makes a rush in the water and gives utterance to a kind of muttering noise. He is so earnest in the performance of his parental duties that the fishermen at times, if the eggs be attached to the roots of water-plants deep in the water, drag them into as shallow a place as possible; the male fish will still keep by the young, and, if it so happen, will be caught by the hook when snapping at the little fish that come by; if, however, he be sensible by experience of the danger of the hook, he will still keep by his charge, and with his extremely strong teeth will bite the hook in pieces.

All fishes, both those that wander about and those that are stationary, occupy the districts where they were born or very similar places, for their natural food is found there. Carnivorous fish wander most; and all fish are carnivorous with the exception of a few, such as the mullet, the saupe, the red mullet, and the chalcis. The so-called pholis gives out a mucous discharge, which envelops the creature in a kind of nest. Of shell-fish, and fish that are finless, the scallop moves with greatest force and to the greatest distance, impelled along by some internal energy; the murex or purple-fish, and others that resemble it, move hardly at all. Out of the lagoon of Pyrrha all the fishes swim in winter-time, except the sea-gudgeon; they swim out owing to the cold, for the narrow waters are colder

than the outer sea, and on the return of the early summer they all swim back again. In the lagoon no scarus is found, nor thritta, nor any other species of the spiny fish, no spotted dogfish, no spiny dogfish, no sea-crawfish, no octopus either of the common or the musky kinds, and certain other fish are also absent; but of fish that are found in the lagoon the white gudgeon is not a marine fish. Of fishes the oviparous are in their prime in the early summer until the spawning time; the viviparous in the autumn, as is also the case with the mullet, the red mullet, and all such fish. In the neighbourhood of Lesbos, the fishes of the outer sea, or of the lagoon, bring forth their eggs or young in the lagoon; sexual union takes place in the autumn, and parturition in the spring. With fishes of the cartilaginous kind, the males and females swarm together in the autumn for the sake of sexual union; in the early summer they come swimming in, and keep apart until after parturition; the two sexes are often taken linked together in sexual union.

Of molluscs the sepia is the most cunning, and is the only species that employs its dark liquid for the sake of concealment as well as from fear: the octopus and calamary make the discharge solely from fear. These creatures never discharge the pigment in its entirety; and after a discharge the pigment accumulates again. The sepia, as has been said, often uses its colouring pigment for concealment; it shows itself in front of the pigment and then retreats back into it; it also hunts with its long tentacles not only little fishes, but oftentimes even mullets. The octopus is a stupid creature, for it will approach a man's hand if it be lowered in the water; but it is neat and thrifty in its habits: that is, it lays up stores in its nest, and, after eating up all that is eatable, it ejects the shells and sheaths of crabs and shell-fish, and the skeletons of little fishes. It seeks its prey by so changing its colour as to render it like the colour of the stones adjacent to it; it does so also when alarmed. By some the sepia is said to perform the same trick; that is, they say it can

change its colour so as to make it resemble the colour of its habitat. The only fish that can do this is the angelfish, that is, it can change its colour like the octopus. The octopus as a rule does not live the year out. It has a natural tendency to run off into liquid; for, if beaten and squeezed, it keeps losing substance and at last disappears. The female after parturition is peculiarly subject to this colliquefaction; it becomes stupid; if tossed about by waves, it submits impassively; a man, if he dived, could catch it with the hand; it gets covered over with slime, and makes no effort to catch its wonted prey. The male becomes leathery and clammy. As a proof that they do not live into a second year there is the fact that, after the birth of the little octopuses in the late summer or beginning of autumn, it is seldom that a large-sized octopus is visible, whereas a little before this time of year the creature is at its largest. After the eggs are laid, they say that both the male and the female grow so old and feeble that they are preyed upon by little fish, and with ease dragged from their holes; and that this could not have been done previously; they say also that this is not the case with the small and young octopus, but that the young creature is much stronger than the grown-up one. Neither does the sepia live into a second year. The octopus is the only mollusc that ventures on to dry land; it walks by preference on rough ground; it is firm all over when you squeeze it, excepting in the neck. So much for the mollusca.

It is also said that they make a thin rough shell about them like a hard sheath, and that this is made larger and larger as the animal grows larger, and that it comes out of the sheath as though out of a den or dwelling place.

The nautilus (or argonaut) is a poulpe or octopus, but one peculiar both in its nature and its habits. It rises up from deep water and swims on the surface; it rises with its shell down-turned in order that it may rise the more easily and swim with

it empty, but after reaching the surface it shifts the position of the shell. In between its feelers it has a certain amount of web-growth, resembling the substance between the toes of web-footed birds; only that with these latter the substance is thick, while with the nautilus it is thin and like a spider's web. It uses this structure, when a breeze is blowing, for a sail, and lets down some of its feelers alongside as rudder-oars. If it be frightened it fills its shell with water and sinks. With regard to the mode of generation and the growth of the shell knowledge from observation is not yet satisfactory; the shell, however, does not appear to be there from the beginning, but to grow in their cases as in that of other shell-fish; neither is it ascertained for certain whether the animal can live when stripped of the shell.

38

Of all insects, one may also say of all living creatures, the most industrious are the ant, the bee, the hornet, the wasp, and in point of fact all creatures akin to these; of spiders some are more skilful and more resourceful than others. The way in which ants work is open to ordinary observation; how they all march one after the other when they are engaged in putting away and storing up their food; all this may be seen, for they carry on their work even during bright moonlight nights.

39

Of spiders and phalangia there are many species. Of the venomous phalangia there are two; one that resembles the so-

called wolf-spider, small, speckled, and tapering to a point; it moves with leaps, from which habit it is nicknamed ‘the flea’: the other kind is large, black in colour, with long front legs; it is heavy in its movements, walks slowly, is not very strong, and never leaps. (Of all the other species wherewith poison-vendors supply themselves, some give a weak bite, and others never bite at all. There is another kind, comprising the so-called wolf-spiders.) Of these spiders the small one weaves no web, and the large weaves a rude and poorly built one on the ground or on dry stone walls. It always builds its web over hollow places inside of which it keeps a watch on the end-threads, until some creature gets into the web and begins to struggle, when out the spider pounces. The speckled kind makes a little shabby web under trees.

There is a third species of this animal, preeminently clever and artistic. It first weaves a thread stretching to all the exterior ends of the future web; then from the centre, which it hits upon with great accuracy, it stretches the warp; on the warp it puts what corresponds to the woof, and then weaves the whole together. It sleeps and stores its food away from the centre, but it is at the centre that it keeps watch for its prey. Then, when any creature touches the web and the centre is set in motion, it first ties and wraps the creature round with threads until it renders it helpless, then lifts it and carries it off, and, if it happens to be hungry, sucks out the life-juices – for that is the way it feeds; but, if it be not hungry, it first mends any damage done and then hastens again to its quest of prey. If something comes meanwhile into the net, the spider at first makes for the centre, and then goes back to its entangled prey as from a fixed starting point. If any one injures a portion of the web, it recommences weaving at sunrise or at sunset, because it is chiefly at these periods that creatures are caught in the web. It is the female that does the weaving and the hunting, but the male takes a share of the booty captured.

Of the skilful spiders, weaving a substantial web, there are two kinds, the larger and the smaller. The one has long legs and keeps watch while swinging downwards from the web: from its large size it cannot easily conceal itself, and so it keeps underneath, so that its prey may not be frightened off, but may strike upon the web's upper surface; the less awkwardly formed one lies in wait on the top, using a little hole for a lurking-place. Spiders can spin webs from the time of their birth, not from their interior as a superfluity or excretion, as Democritus avers, but off their body as a kind of tree-bark, like the creatures that shoot out with their hair, as for instance the porcupine. The creature can attack animals larger than itself, and enwrap them with its threads: in other words, it will attack a small lizard, run round and draw threads about its mouth until it closes the mouth up; then it comes up and bites it.

40

So much for the spider. Of insects, there is a genus that has no one name that comprehends all the species, though all the species are akin to one another in form; it consists of all the insects that construct a honeycomb: to wit, the bee, and all the insects that resemble it in form.

There are nine varieties, of which six are gregarious – the bee, the king-bee, the drone bee, the annual wasp, and, furthermore, the anthrene (or hornet), and the tenthredo (or ground-wasp); three are solitary – the smaller siren, of a dun colour, the larger siren, black and speckled, and the third, the largest of all, that is called the humble-bee. Now ants never go a-hunting, but gather up what is ready to hand; the spider makes nothing, and lays up no store, but simply goes a-hunting for its food; while the bee –

for we shall by and by treat of the nine varieties – does not go a-hunting, but constructs its food out of gathered material and stores it away, for honey is the bee's food. This fact is shown by the beekeepers' attempt to remove the combs; for the bees, when they are fumigated, and are suffering great distress from the process, then devour the honey most ravenously, whereas at other times they are never observed to be so greedy, but apparently are thrifty and disposed to lay by for their future sustenance. They have also another food which is called bee-bread; this is scarcer than honey and has a sweet figlike taste; this they carry as they do the wax on their legs.

Very remarkable diversity is observed in their methods of working and their general habits. When the hive has been delivered to them clean and empty, they build their waxen cells, bringing in the juice of all kinds of flowers and the 'tears' or exuding sap of trees, such as willows and elms and such others as are particularly given to the exudation of gum. With this material they besmear the groundwork, to provide against attacks of other creatures; the bee-keepers call this stuff 'stop-wax'. They also with the same material narrow by side-building the entrances to the hive if they are too wide. They first build cells for themselves; then for the so-called kings and the drones; for themselves they are always building, for the kings only when the brood of young is numerous, and cells for the drones they build if a superabundance of honey should suggest their doing so. They build the royal cells next to their own, and they are of small bulk; the drones' cells they build near by, and these latter are less in bulk than the bee's cells.

They begin building the combs downwards from the top of the hive, and go down and down building many combs connected together until they reach the bottom. The cells, both those for the honey and those also for the grubs, are double-doored; for two cells are ranged about a single base, one pointing one way

and one the other, after the manner of a double (or hour-glass-shaped) goblet. The cells that lie at the commencement of the combs and are attached to the hives, to the extent of two or three concentric circular rows, are small and devoid of honey; the cells that are well filled with honey are most thoroughly luted with wax. At the entry to the hive the aperture of the doorway is smeared with mitys; this substance is a deep black, and is a sort of dross or residual by-product of wax; it has a pungent odour, and is a cure for bruises and suppurating sores. The greasy stuff that comes next is pitch-wax; it has a less pungent odour and is less medicinal than the mitys. Some say that the drones construct combs by themselves in the same hive and in the same comb that they share with the bees; but that they make no honey, but subsist, they and their grubs also, on the honey made by the bees. The drones, as a rule, keep inside the hive; when they go out of doors, they soar up in the air in a stream, whirling round and round in a kind of gymnastic exercise; when this is over, they come inside the hive and feed to repletion ravenously. The kings never quit the hive, except in conjunction with the entire swarm, either for food or for any other reason. They say that, if a young swarm go astray, it will turn back upon its route and by the aid of scent seek out its leader. It is said that if he is unable to fly he is carried by the swarm, and that if he dies the swarm perishes; and that, if this swarm outlives the king for a while and constructs combs, no honey is produced and the bees soon die out.

Bees scramble up the stalks of flowers and rapidly gather the bees-wax with their front legs; the front legs wipe it off on to the middle legs, and these pass it on to the hollow curves of the hind-legs; when thus laden, they fly away home, and one may see plainly that their load is a heavy one. On each expedition the bee does not fly from a flower of one kind to a flower of another, but flies from one violet, say, to another violet, and never meddles with another flower until it has got back to the

hive; on reaching the hive they throw off their load, and each bee on his return is accompanied by three or four companions. One cannot well tell what is the substance they gather, nor the exact process of their work. Their mode of gathering wax has been observed on olive-trees, as owing to the thickness of the leaves the bees remain stationary for a considerable while. After this work is over, they attend to the grubs. There is nothing to prevent grubs, honey, and drones being all found in one and the same comb. As long as the leader is alive, the drones are said to be produced apart by themselves; if he be no longer living, they are said to be reared by the bees in their own cells, and under these circumstances to become more spirited: for this reason they are called 'sting-drones', not that they really have stings, but that they have the wish without the power, to use such weapons. The cells for the drones are larger than the others; sometimes the bees construct cells for the drones apart, but usually they put them in amongst their own; and when this is the case the bee-keepers cut the drone-cells out of the combs.

There are several species of bees, as has been said; two of 'kings', the better kind red, the other black and variegated, and twice as big as the working-bee. The best workingbee is small, round, and speckled: another kind is long and like an anthrene wasp; another kind is what is called the robber-bee, black and flat-bellied; then there is the drone, the largest of all, but devoid of sting, and lazy. There is a difference between the progeny of bees that inhabit cultivated land and of those from the mountains: the forest-bees are more shaggy, smaller, more industrious and more fierce. Working-bees make their combs all even, with the superficial covering quite smooth. Each comb is of one kind only: that is, it contains either bees only, or grubs only, or drones only; if it happen, however, that they make in one and the same comb all these kinds of cells, each separate kind will be built in a continuous row right through. The long bees build uneven combs, with the lids of the cells protuberant,

like those of the anthrene; grubs and everything else have no fixed places, but are put anywhere; from these bees come inferior kings, a large quantity of drones, and the so-called robber-bee; they produce either no honey at all, or honey in very small quantities. Bees brood over the combs and so mature them; if they fail to do so, the combs are said to go bad and to get covered with a sort of spider's web. If they can keep brooding over the part undamaged, the damaged part simply eats itself away; if they cannot so brood, the entire comb perishes; in the damaged combs small worms are engendered, which take on wings and fly away. When the combs keep settling down, the bees restore the level surface, and put props underneath the combs to give themselves free passage-room; for if such free passage be lacking they cannot brood, and the cobwebs come on. When the robber-bee and the drone appear, not only do they do no work themselves, but they actually damage the work of the other bees; if they are caught in the act, they are killed by the working-bees. These bees also kill without mercy most of their kings, and especially kings of the inferior sort; and this they do for fear a multiplicity of kings should lead to a dismemberment of the hive. They kill them especially when the hive is deficient in grubs, and a swarm is not intended to take place; under these circumstances they destroy the cells of the kings if they have been prepared, on the ground that these kings are always ready to lead out swarms. They destroy also the combs of the drones if a failure in the supply be threatening and the hive runs short of provisions; under such circumstances they fight desperately with all who try to take their honey, and eject from the hive all the resident drones; and oftentimes the drones are to be seen sitting apart in the hive. The little bees fight vigorously with the long kind, and try to banish them from the hives; if they succeed, the hive will be unusually productive, but if the bigger bees get left mistresses of the field they pass the time in idleness, and no good at all but die out before the

autumn. Whenever the working-bees kill an enemy they try to do so out of doors; and whenever one of their own body dies, they carry the dead bee out of doors also. The so-called robber-bees spoil their own combs, and, if they can do so unnoticed, enter and spoil the combs of other bees; if they are caught in the act they are put to death. It is no easy task for them to escape detection, for there are sentinels on guard at every entry; and, even if they do escape detection on entering, afterwards from a surfeit of food they cannot fly, but go rolling about in front of the hive, so that their chances of escape are small indeed. The kings are never themselves seen outside the hive except with a swarm in flight: during which time all the other bees cluster around them. When the flight of a swarm is imminent, a monotonous and quite peculiar sound made by all the bees is heard for several days, and for two or three days in advance a few bees are seen flying round the hive; it has never as yet been ascertained, owing to the difficulty of the observation, whether or no the king is among these. When they have swarmed, they fly away and separate off to each of the kings; if a small swarm happens to settle near to a large one, it will shift to join this large one, and if the king whom they have abandoned follows them, they put him to death. So much for the quitting of the hive and the swarmflight. Separate detachments of bees are told off for diverse operations; that is, some carry flower-produce, others carry water, others smooth and arrange the combs. A bee carries water when it is rearing grubs. No bee ever settles on the flesh of any creature, or ever eats animal food. They have no fixed date for commencing work; but when their provender is forthcoming and they are in comfortable trim, and by preference in summer, they set to work, and when the weather is fine they work incessantly.

The bee, when quite young and in fact only three days old, after shedding its chrysalis-case, begins to work if it be well fed. When a swarm is settling, some bees detach themselves in

search of food and return back to the swarm. In hives that are in good condition the production of young bees is discontinued only for the forty days that follow the winter solstice. When the grubs are grown, the bees put food beside them and cover them with a coating of wax; and, as soon as the grub is strong enough, he of his own accord breaks the lid and comes out. Creatures that make their appearance in hives and spoil the combs the working-bees clear out, but the other bees from sheer laziness look with indifference on damage done to their produce. When the bee-masters take out the combs, they leave enough food behind for winter use; if it be sufficient in quantity, the occupants of the hive will survive; if it be insufficient, then, if the weather be rough, they die on the spot, but if it be fair, they fly away and desert the hive. They feed on honey summer and winter; but they store up another article of food resembling wax in hardness, which by some is called sandarace, or bee-bread. Their worst enemies are wasps and the birds named titmice, and furthermore the swallow and the bee-eater. The frogs in the marsh also catch them if they come in their way by the water-side, and for this reason bee-keepers chase the frogs from the ponds from which the bees take water; they destroy also wasps' nests, and the nests of swallows, in the neighbourhood of the hives, and also the nests of bee-eaters. Bees have fear only of one another. They fight with one another and with wasps. Away from the hive they attack neither their own species nor any other creature, but in the close proximity of the hive they kill whatever they get hold of. Bees that sting die from their inability to extract the sting without at the same time extracting their intestines. True, they often recover, if the person stung takes the trouble to press the sting out; but once it loses its sting the bee must die. They can kill with their stings even large animals; in fact, a horse has been known to have been stung to death by them. The kings are the least disposed to show anger or to inflict a sting. Bees that die are removed from

the hive, and in every way the creature is remarkable for its cleanly habits; in point of fact, they often fly away to a distance to void their excrement because it is malodorous; and, as has been said, they are annoyed by all bad smells and by the scent of perfumes, so much so that they sting people that use perfumes.

They perish from a number of accidental causes, and when their kings become too numerous and try each to carry away a portion of the swarm.

The toad also feeds on bees; he comes to the doorway of the hive, puffs himself out as he sits on the watch, and devours the creatures as they come flying out; the bees can in no way retaliate, but the bee-keeper makes a point of killing him.

As for the class of bee that has been spoken of as inferior or good-for-nothing, and as constructing its combs so roughly, some bee-keepers say that it is the young bees that act so from inexperience; and the bees of the current year are termed young. The young bees do not sting as the others do; and it is for this reason that swarms may be safely carried, as it is of young bees that they are composed. When honey runs short they expel the drones, and the bee-keepers supply the bees with figs and sweet-tasting articles of food. The elder bees do the indoor work, and are rough and hairy from staying indoors; the young bees do the outer carrying, and are comparatively smooth. They kill the drones also when in their work they are confined for room; the drones, by the way, live in the innermost recess of the hive. On one occasion, when a hive was in a poor condition, some of the occupants assailed a foreign hive; proving victorious in a combat they took to carrying off the honey; when the bee-keeper tried to kill them, the other bees came out and tried to beat off the enemy but made no attempt to sting the man.

The diseases that chiefly attack prosperous hives are first of all the clerus-this consists in a growth of little worms on the floor, from which, as they develop, a kind of cobweb grows over the entire hive, and the combs decay; another diseased condition is indicated in a lassitude on the part of the bees and in malodorousness of the hive. Bees feed on thyme; and the white thyme is better than the red. In summer the place for the hive should be cool, and in winter warm. They are very apt to fall sick if the plant they are at work on be mildewed. In a high wind they carry a stone by way of ballast to steady them. If a stream be near at hand, they drink from it and from it only, but before they drink they first deposit their load; if there be no water near at hand, they disgorge their honey as they drink elsewhere, and at once make off to work. There are two seasons for making honey, spring and autumn; the spring honey is sweeter, whiter, and in every way better than the autumn honey. Superior honey comes from fresh comb, and from young shoots; the red honey is inferior, and owes its inferiority to the comb in which it is deposited, just as wine is apt to be spoiled by its cask; consequently, one should have it looked to and dried. When the thyme is in flower and the comb is full, the honey does not harden. The honey that is golden in hue is excellent. White honey does not come from thyme pure and simple; it is good as a salve for sore eyes and wounds. Poor honey always floats on the surface and should be skimmed off; the fine clear honey rests below. When the floral world is in full bloom, then they make wax; consequently you must then take the wax out of the hive, for they go to work on new wax at once. The flowers from which they gather honey are as follows: the spindle-tree, the melilot-clover, king's-spear, myrtle, flowering-reed, withy, and broom. When they work at thyme, they mix in water before sealing up the comb. As has been already stated, they all either fly to a distance to discharge their excrement or make the discharge into one single comb. The little bees, as has been said,

are more industrious than the big ones; their wings are battered; their colour is black, and they have a burnt-up aspect. Gaudy and showy bees, like gaudy and showy women, are good-for-nothings.

Bees seem to take a pleasure in listening to a rattling noise; and consequently men say that they can muster them into a hive by rattling with crockery or stones; it is uncertain, however, whether or no they can hear the noise at all and also whether their procedure is due to pleasure or alarm. They expel from the hive all idlers and unthrifts. As has been said, they differentiate their work; some make wax, some make honey, some make bee-bread, some shape and mould combs, some bring water to the cells and mingle it with the honey, some engage in out-of-door work. At early dawn they make no noise, until some one particular bee makes a buzzing noise two or three times and thereby awakes the rest; hereupon they all fly in a body to work. By and by they return and at first are noisy; then the noise gradually decreases, until at last some one bee flies round about, making a buzzing noise, and apparently calling on the others to go to sleep; then all of a sudden there is a dead silence.

The hive is known to be in good condition if the noise heard within it is loud, and if the bees make a flutter as they go out and in; for at this time they are constructing brood-cells. They suffer most from hunger when they recommence work after winter. They become somewhat lazy if the bee-keeper, in robbing the hive, leave behind too much honey; still one should leave cells numerous in proportion to the population, for the bees work in a spiritless way if too few combs are left. They become idle also, as being dispirited, if the hive be too big. A hive yields to the bee-keeper six or nine pints of honey; a prosperous hive will yield twelve or fifteen pints, exceptionally good hives eighteen. Sheep and, as has been said, wasps are

enemies to the bees. Bee-keepers entrap the latter, by putting a flat dish on the ground with pieces of meat on it; when a number of the wasps settle on it, they cover them with a lid and put the dish and its contents on the fire. It is a good thing to have a few drones in a hive, as their presence increases the industry of the workers. Bees can tell the approach of rough weather or of rain; and the proof is that they will not fly away, but even while it is as yet fine they go fluttering about within a restricted space, and the bee-keeper knows from this that they are expecting bad weather. When the bees inside the hive hang clustering to one another, it is a sign that the swarm is intending to quit; consequently, occasion, when a bee-keepers, on seeing this, besprinkle the hive with sweet wine. It is advisable to plant about the hives pear-trees, beans, Median-grass, Syrian-grass, yellow pulse, myrtle, poppies, creeping-thyme, and almond-trees. Some bee-keepers sprinkle their bees with flour, and can distinguish them from others when they are at work out of doors. If the spring be late, or if there be drought or blight, then grubs are all the fewer in the hives. So much for the habits of bees.

41

Of wasps, there are two kinds. Of these kinds one is wild and scarce, lives on the mountains, engenders grubs not underground but on oak-trees, is larger, longer, and blacker than the other kind, is invariably speckled and furnished with a sting, and is remarkably courageous. The pain from its sting is more severe than that caused by the others, for the instrument that causes the pain is larger, in proportion to its own larger size. These wild live over into a second year, and in winter time, when oaks have been in course of felling, they may be seen

coming out and flying away. They lie concealed during the winter, and live in the interior of logs of wood. Some of them are mother-wasps and some are workers, as with the tamer kind; but it is by observation of the tame wasps that one may learn the varied characteristics of the mothers and the workers. For in the case of the tame wasps also there are two kinds; one consists of leaders, who are called mothers, and the other of workers. The leaders are far larger and milder-tempered than the others. The workers do not live over into a second year, but all die when winter comes on; and this can be proved, for at the commencement of winter the workers become drowsy, and about the time of the winter solstice they are never seen at all. The leaders, the so-called mothers, are seen all through the winter, and live in holes underground; for men when ploughing or digging in winter have often come upon mother-wasps, but never upon workers. The mode of reproduction of wasps is as follows. At the approach of summer, when the leaders have found a sheltered spot, they take to moulding their combs, and construct the so-called sphecons, – little nests containing four cells or thereabouts, and in these are produced working-wasps but not mothers. When these are grown up, then they construct other larger combs upon the first, and then again in like manner others; so that by the close of autumn there are numerous large combs in which the leader, the so-called mother, engenders no longer working-wasps but mothers. These develop high up in the nest as large grubs, in cells that occur in groups of four or rather more, pretty much in the same way as we have seen the grubs of the king-bees to be produced in their cells. After the birth of the working-grubs in the cells, the leaders do nothing and the workers have to supply them with nourishment; and this is inferred from the fact that the leaders (of the working-wasps) no longer fly out at this time, but rest quietly indoors. Whether the leaders of last year after engendering new leaders are killed by the new brood, and

whether this occurs invariably or whether they can live for a longer time, has not been ascertained by actual observation; neither can we speak with certainty, as from observation, as to the age attained by the mother-wasp or by the wild wasps, or as to any other similar phenomenon. The mother-wasp is broad and heavy, fatter and larger than the ordinary wasp, and from its weight not very strong on the wing; these wasps cannot fly far, and for this reason they always rest inside the nest, building and managing its indoor arrangements. The so-called mother-wasps are found in most of the nests; it is a matter of doubt whether or no they are provided with stings; in all probability, like the king-bees, they have stings, but never protrude them for offence. Of the ordinary wasps some are destitute of stings, like the drone-bees, and some are provided with them. Those unprovided therewith are smaller and less spirited and never fight, while the others are big and courageous; and these latter, by some, are called males, and the stingless, females. At the approach of winter many of the wasps that have stings appear to lose them; but we have never met an eyewitness of this phenomenon. Wasps are more abundant in times of drought and in wild localities. They live underground; their combs they mould out of chips and earth, each comb from a single origin, like a kind of root. They feed on certain flowers and fruits, but for the most part on animal food. Some of the tame wasps have been observed when sexually united, but it was not determined whether both, or neither, had stings, or whether one had a sting and the other had not; wild wasps have been seen under similar circumstances, when one was seen to have a sting but the case of the other was left undetermined. The wasp-grub does not appear to come into existence by parturition, for at the outset the grub is too big to be the offspring of a wasp. If you take a wasp by the feet and let him buzz with the vibration of his wings, wasps that have no stings will fly toward it, and wasps that have stings will not; from which fact it is inferred by some

that one set are males and the other females. In holes in the ground in winter-time wasps are found, some with stings, and some without. Some build cells, small and few in number; others build many and large ones. The so-called mothers are caught at the change of season, mostly on elm-trees, while gathering a substance sticky and gumlike. A large number of mother-wasps are found when in the previous year wasps have been numerous and the weather rainy; they are captured in precipitous places, or in vertical clefts in the ground, and they all appear to be furnished with stings.

42

So much for the habits of wasps.

Anthrenae do not subsist by culling from flowers as bees do, but for the most part on animal food: for this reason they hover about dung; for they chase the large flies, and after catching them lop off their heads and fly away with the rest of the carcases; they are furthermore fond of sweet fruits. Such is their food. They have also kings or leaders like bees and wasps; and their leaders are larger in proportion to themselves than are wasp-kings to wasps or bee-kings to bees. The anthrena-king, like the wasp-king, lives indoors. Anthrenae build their nests underground, scraping out the soil like ants; for neither anthrenae nor wasps go off in swarms as bees do, but successive layers of young anthrenae keep to the same habitat, and go on enlarging their nest by scraping out more and more of soil. The nest accordingly attains a great size; in fact, from a particularly prosperous nest have been removed three and even four baskets full of combs. They do not, like bees, store up food, but pass the winter in a torpid condition; the greater part of

them die in the winter, but it is uncertain whether that can be said of them all, In the hives of bees several kings are found and they lead off detachments in swarms, but in the anthrena's nest only one king is found. When individual anthrenae have strayed from their nest, they cluster on a tree and construct combs, as may be often seen above-ground, and in this nest they produce a king; when the king is full-grown, he leads them away and settles them along with himself in a hive or nest. With regard to their sexual unions, and the method of their reproduction, nothing is known from actual observation. Among bees both the drones and the kings are stingless, and so are certain wasps, as has been said; but anthrenae appear to be all furnished with stings: though, by the way, it would well be worth while to carry out investigation as to whether the anthrena-king has a sting or not.

43

Humble-bees produce their young under a stone, right on the ground, in a couple of cells or little more; in these cells is found an attempt at honey, of a poor description. The tenthredon is like the anthrena, but speckled, and about as broad as a bee. Being epicures as to their food, they fly, one at a time, into kitchens and on to slices of fish and the like dainties. The tenthredon brings forth, like the wasp, underground, and is very prolific; its nest is much bigger and longer than that of the wasp. So much for the methods of working and the habits of life of the bee, the wasp, and all the other similar insects.

44

As regards the disposition or temper of animals, as has been previously observed, one may detect great differences in respect to courage and timidity, as also, even among wild animals, in regard to tameness and wildness. The lion, while he is eating, is most ferocious; but when he is not hungry and has had a good meal, he is quite gentle. He is totally devoid of suspicion or nervous fear, is fond of romping with animals that have been reared along with him and to whom he is accustomed, and manifests great affection towards them. In the chase, as long as he is in view, he makes no attempt to run and shows no fear, but even if he be compelled by the multitude of the hunters to retreat, he withdraws deliberately, step by step, every now and then turning his head to regard his pursuers. If, however, he reach wooded cover, then he runs at full speed, until he comes to open ground, when he resumes his leisurely retreat. When, in the open, he is forced by the number of the hunters to run while in full view, he does run at the top of his speed, but without leaping and bounding. This running of his is evenly and continuously kept up like the running of a dog; but when he is in pursuit of his prey and is close behind, he makes a sudden pounce upon it. The two statements made regarding him are quite true; the one that he is especially afraid of fire, as Homer pictures him in the line – 'and glowing torches, which, though fierce he dreads,' – and the other, that he keeps a steady eye upon the hunter who hits him, and flings himself upon him. If a hunter hit him, without hurting him, then if with a bound he gets hold of him, he will do him no harm, not even with his claws, but after shaking him and giving him a fright will let him go again. They invade the cattle-folds and attack human beings when they are grown old and so by reason of old age and the diseased condition of their teeth are unable to pursue their wonted prey. They live to a good old age. The lion who was captured when lame, had a number of his teeth broken; which

fact was regarded by some as a proof of the longevity of lions, as he could hardly have been reduced to this condition except at an advanced age. There are two species of lions, the plump, curly-maned, and the long-bodied, straight maned; the latter kind is courageous, and the former comparatively timid; sometimes they run away with their tail between their legs, like a dog. A lion was once seen to be on the point of attacking a boar, but to run away when the boar stiffened his bristles in defence. It is susceptible of hurt from a wound in the flank, but on any other part of its frame will endure any number of blows, and its head is especially hard. Whenever it inflicts a wound, either by its teeth or its claws, there flows from the wounded parts suppurating matter, quite yellow, and not to be stanched by bandage or sponge; the treatment for such a wound is the same as that for the bite of a dog.

The thos, or civet, is fond of man's company; it does him no harm and is not much afraid of him, but it is an enemy to the dog and the lion, and consequently is not found in the same habitat with them. The little ones are the best. Some say that there are two species of the animal, and some say, three; there are probably not more than three, but, as is the case with certain of the fishes, birds, and quadrupeds, this animal changes in appearance with the change of season. His colour in winter is not the same as it is in summer; in summer the animal is smooth-haired, in winter he is clothed in fur.

45

The bison is found in Paeonia on Mount Messapium, which separates Paeonia from Maedica; and the Paeonians call it the monapos. It is the size of a bull, but stouter in build, and not

long in the body; its skin, stretched tight on a frame, would give sitting room for seven people. In general it resembles the ox in appearance, except that it has a mane that reaches down to the point of the shoulder, as that of the horse reaches down to its withers; but the hair in its mane is softer than the hair in the horse's mane, and clings more closely. The colour of the hair is brown-yellow; the mane reaches down to the eyes, and is deep and thick. The colour of the body is half red, half ashen-grey, like that of the so-called chestnut horse, but rougher. It has an undercoat of woolly hair. The animal is not found either very black or very red. It has the bellow of a bull. Its horns are crooked, turned inwards towards each other and useless for purposes of self-defence; they are a span broad, or a little more, and in volume each horn would hold about three pints of liquid; the black colour of the horn is beautiful and bright. The tuft of hair on the forehead reaches down to the eyes, so that the animal sees objects on either flank better than objects right in front. It has no upper teeth, as is the case also with kine and all other horned animals. Its legs are hairy; it is cloven-footed, and the tail, which resembles that of the ox, seems not big enough for the size of its body. It tosses up dust and scoops out the ground with its hooves, like the bull. Its skin is impervious to blows. Owing to the savour of its flesh it is sought for in the chase. When it is wounded it runs away, and stops only when thoroughly exhausted. It defends itself against an assailant by kicking and projecting its excrement to a distance of eight yards; this device it can easily adopt over and over again, and the excrement is so pungent that the hair of hunting-dogs is burnt off by it. It is only when the animal is disturbed or alarmed that the dung has this property; when the animal is undisturbed it has no blistering effect. So much for the shape and habits of the animal. When the season comes for parturition the mothers give birth to their young in troops upon the mountains. Before dropping their young they scatter their

dung in all directions, making a kind of circular rampart around them; for the animal has the faculty of ejecting excrement in most extraordinary quantities.

46

Of all wild animals the most easily tamed and the gentlest is the elephant. It can be taught a number of tricks, the drift and meaning of which it understands; as, for instance, it can taught to kneel in presence of the king. It is very sensitive, and possessed of an intelligence superior to that of other animals. When the male has had sexual union with the female, and the female has conceived, the male has no further intercourse with her.

Some say that the elephant lives for two hundred years; others, for one hundred and twenty; that the female lives nearly as long as the male; that they reach their prime about the age of sixty, and that they are sensitive to inclement weather and frost. The elephant is found by the banks of rivers, but he is not a river animal; he can make his way through water, as long as the tip of his trunk can be above the surface, for he blows with his trunk and breathes through it. The animal is a poor swimmer owing to the heavy weight of his body.

47

The male camel declines intercourse with its mother; if his keeper tries compulsion, he evinces disinclination. On one occasion, when intercourse was being declined by the young

male, the keeper covered over the mother and put the young male to her; but, when after the intercourse the wrapping had been removed, though the operation was completed and could not be revoked, still by and by he bit his keeper to death. A story goes that the king of Scythia had a highly-bred mare, and that all her foals were splendid; that wishing to mate the best of the young males with the mother, he had him brought to the stall for the purpose; that the young horse declined; that, after the mother's head had been concealed in a wrapper he, in ignorance, had intercourse; and that, when immediately afterwards the wrapper was removed and the head of the mare was rendered visible, the young horse ran way and hurled himself down a precipice.

48

Among the sea-fishes many stories are told about the dolphin, indicative of his gentle and kindly nature, and of manifestations of passionate attachment to boys, in and about Tarentum, Caria, and other places. The story goes that, after a dolphin had been caught and wounded off the coast of Caria, a shoal of dolphins came into the harbour and stopped there until the fisherman let his captive go free; whereupon the shoal departed. A shoal of young dolphins is always, by way of protection, followed by a large one. On one occasion a shoal of dolphins, large and small, was seen, and two dolphins at a little distance appeared swimming in underneath a little dead dolphin when it was sinking, and supporting it on their backs, trying out of compassion to prevent its being devoured by some predaceous fish. Incredible stories are told regarding the rapidity of movement of this creature. It appears to be the fleetest of all animals, marine and terrestrial, and it can leap over the masts

of large vessels. This speed is chiefly manifested when they are pursuing a fish for food; then, if the fish endeavours to escape, they pursue him in their ravenous hunger down to deep waters; but, when the necessary return swim is getting too long, they hold in their breath, as though calculating the length of it, and then draw themselves together for an effort and shoot up like arrows, trying to make the long ascent rapidly in order to breathe, and in the effort they spring right over the a ship's masts if a ship be in the vicinity. This same phenomenon is observed in divers, when they have plunged into deep water; that is, they pull themselves together and rise with a speed proportional to their strength. Dolphins live together in pairs, male and female. It is not known for what reason they run themselves aground on dry land; at all events, it is said that they do so at times, and for no obvious reason.

49

Just as with all animals a change of action follows a change of circumstance, so also a change of character follows a change of action, and often some portions of the physical frame undergo a change, occurs in the case of birds. Hens, for instance, when they have beaten the cock in a fight, will crow like the cock and endeavour to tread him; the crest rises up on their head and the tail-feathers on the rump, so that it becomes difficult to recognize that they are hens; in some cases there is a growth of small spurs. On the death of a hen a cock has been seen to undertake the maternal duties, leading the chickens about and providing them with food, and so intent upon these duties as to cease crowing and indulging his sexual propensities. Some cock-birds are congenitally so feminine that they will submit patiently to other males who attempt to tread them.

50

Some animals change their form and character, not only at certain ages and at certain seasons, but in consequence of being castrated; and all animals possessed of testicles may be submitted to this operation. Birds have their testicles inside, and oviparous quadrupeds close to the loins; and of viviparous animals that walk some have them inside, and most have them outside, but all have them at the lower end of the belly. Birds are castrated at the rump at the part where the two sexes unite in copulation. If you burn this twice or thrice with hot irons, then, if the bird be full-grown, his crest grows sallow, he ceases to crow, and foregoes sexual passion; but if you cauterize the bird when young, none of these male attributes propensities will come to him as he grows up. The case is the same with men: if you mutilate them in boyhood, the later-growing hair never comes, and the voice never changes but remains high-pitched; if they be mutilated in early manhood, the late growths of hair quit them except the growth on the groin, and that diminishes but does not entirely depart. The congenital growths of hair never fall out, for a eunuch never grows bald. In the case of all castrated or mutilated male quadrupeds the voice changes to the feminine voice. All other quadrupeds when castrated, unless the operation be performed when they are young, invariably die; but in the case of boars, and in their case only, the age at which the operation is performed produces no difference. All animals, if operated on when they are young, become bigger and better looking than their unmutilated fellows; if they be mutilated when full-grown, they do not take on any increase of size. If stags be mutilated, when, by reason of their age, they have as yet no horns, they never grow horns at

all; if they be mutilated when they have horns, the horns remain unchanged in size, and the animal does not lose them. Calves are mutilated when a year old; otherwise, they turn out uglier and smaller. Steers are mutilated in the following way: they turn the animal over on its back, cut a little off the scrotum at the lower end, and squeeze out the testicles, then push back the roots of them as far as they can, and stop up the incision with hair to give an outlet to suppurating matter; if inflammation ensues, they cauterize the scrotum and put on a plaster. If a full-grown bull be mutilated, he can still to all appearance unite sexually with the cow. The ovaries of sows are excised with the view of quenching in them sexual appetites and of stimulating growth in size and fatness. The sow has first to be kept two days without food, and, after being hung up by the hind legs, it is operated on; they cut the lower belly, about the place where the boars have their testicles, for it is there that the ovary grows, adhering to the two divisions (or horns) of the womb; they cut off a little piece and stitch up the incision. Female camels are mutilated when they are wanted for war purposes, and are mutilated to prevent their being got with young. Some of the inhabitants of Upper Asia have as many as three thousand camels: when they run, they run, in consequence of the length of their stride, much quicker than the horses of Nisaea. As a general rule, mutilated animals grow to a greater length than the unmutilated.

All animals that ruminate derive profit and pleasure from the process of rumination, as they do from the process of eating. It is the animals that lack the upper teeth that ruminate, such as kine, sheep, and goats. In the case of wild animals no observation has been possible; save in the case of animals that are occasionally domesticated, such as the stag, and it, we know, chews the cud. All animals that ruminate generally do so when lying down on the ground. They carry on the process to the greatest extent in winter, and stall-fed ruminants carry it on

for about seven months in the year; beasts that go in herds, as they get their food out of doors, ruminate to a lesser degree and over a lesser period. Some, also, of the animals that have teeth in both jaws ruminate; as, for instance, the Pontic mice, and the fish which from the habit is by some called 'the Ruminant', (as well as other fish).

Long-limbed animals have loose faeces, and broad-chested animals vomit with comparative facility, and these remarks are, in a general way, applicable to quadrupeds, birds, and men.

49B

A considerable number of birds change according to season the colour of their plumage and their note; as, for instance, the owsel becomes yellow instead of black, and its note gets altered, for in summer it has a musical note and in winter a discordant chatter. The thrush also changes its colour; about the throat it is marked in winter with speckles like a starling, in summer distinctly spotted: however, it never alters its note. The nightingale, when the hills are taking on verdure, sings continually for fifteen days and fifteen nights; afterwards it sings, but not continuously. As summer advances it has a different song, not so varied as before, nor so deep, nor so intricately modulated, but simple; it also changes its colour, and in Italy about this season it goes by a different name. It goes into hiding, and is consequently visible only for a brief period. The erithacus (or redbreast) and the so-called redstart change into one another; the former is a winter bird, the latter a summer one, and the difference between them is practically limited to the coloration of their plumage. In the same way with the beccafico and the blackcap; these change into one another.

The beccafico appears about autumn, and the blackcap as soon as autumn has ended. These birds, also, differ from one another only in colour and note; that these birds, two in name, are one in reality is proved by the fact that at the period when the change is in progress each one has been seen with the change as yet incomplete. It is not so very strange that in these cases there is a change in note and in plumage, for even the ring-dove ceases to coo in winter, and recommences cooing when spring comes in; in winter, however, when fine weather has succeeded to very stormy weather, this bird has been known to give its cooing note, to the astonishment of such as were acquainted with its usual winter silence. As a general rule, birds sing most loudly and most diversely in the pairing season. The cuckoo changes its colour, and its note is not clearly heard for a short time previous to its departure. It departs about the rising of the Dog-star, and it reappears from springtime to the rising of the Dog-star. At the rise of this star the bird called by some oenanthe disappears, and reappears when it is setting: thus keeping clear at one time of extreme cold, and at another time of extreme heat. The hoopoe also changes its colour and appearance, as Aeschylus has represented in the following lines:

The Hoopoe, witness to his own distress,

Is clad by Zeus in variable dress:

Now a gay mountain-bird, with knightly crest,

Now in the white hawk's silver plumage drest,

For, timely changing, on the hawk's white wing

He greets the apparition of the Spring.

Thus twofold form and colour are conferred,

In youth and age, upon the selfsame bird.

The spangled raiment marks his youthful days,

The argent his maturity displays;

And when the fields are yellow with ripe corn

Again his particoloured plumes are worn.

But evermore, in sullen discontent,

He seeks the lonely hills, in self-sought banishment.

Of birds, some take a dust-bath by rolling in dust, some take a water-bath, and some take neither the one bath nor the other. Birds that do not fly but keep on the ground take the dust-bath, as for instance the hen, the partridge, the francolin, the crested lark, the pheasant; some of the straight-taloned birds, and such as live on the banks of a river, in marshes, or by the sea, take a water-bath; some birds take both the dust-bath and the waterbath, as for instance the pigeon and the sparrow; of the crooked-taloned birds the greater part take neither the one bath nor the other. So much for the ways of the above-mentioned, but some birds have a peculiar habit of making a noise at their hinder quarters, as, for instance, the turtle-dove; and they make a violent movement of their tails at the same time that they produce this peculiar sound.

Aristotle - On the Parts of Animals

[Translated by William Ogle]

Book I

1

Every systematic science, the humblest and the noblest alike, seems to admit of two distinct kinds of proficiency; one of which may be properly called scientific knowledge of the subject, while the other is a kind of educational acquaintance with it. For an educated man should be able to form a fair off-hand judgement as to the goodness or badness of the method used by a professor in his exposition. To be educated is in fact to be able to do this; and even the man of universal education we deem to be such in virtue of his having this ability. It will, however, of course, be understood that we only ascribe universal education to one who in his own individual person is thus critical in all or nearly all branches of knowledge, and not to one who has a like ability merely in some special subject. For it is possible for a man to have this competence in some one branch of knowledge without having it in all.

It is plain then that, as in other sciences, so in that which inquires into nature, there must be certain canons, by reference to which a hearer shall be able to criticize the method of a professed exposition, quite independently of the question whether the statements made be true or false. Ought we, for instance (to give an illustration of what I mean), to begin by discussing each separate species – man, lion, ox, and the like –

taking each kind in hand independently of the rest, or ought we rather to deal first with the attributes which they have in common in virtue of some common element of their nature, and proceed from this as a basis for the consideration of them separately? For genera that are quite distinct yet oftentimes present many identical phenomena, sleep, for instance, respiration, growth, decay, death, and other similar affections and conditions, which may be passed over for the present, as we are not yet prepared to treat of them with clearness and precision. Now it is plain that if we deal with each species independently of the rest, we shall frequently be obliged to repeat the same statements over and over again; for horse and dog and man present, each and all, every one of the phenomena just enumerated. A discussion therefore of the attributes of each such species separately would necessarily involve frequent repetitions as to characters, themselves identical but recurring in animals specifically distinct. (Very possibly also there may be other characters which, though they present specific differences, yet come under one and the same category. For instance, flying, swimming, walking, creeping, are plainly specifically distinct, but yet are all forms of animal progression.) We must, then, have some clear understanding as to the manner in which our investigation is to be conducted; whether, I mean, we are first to deal with the common or generic characters, and afterwards to take into consideration special peculiarities; or whether we are to start straight off with the ultimate species. For as yet no definite rule has been laid down in this matter. So also there is a like uncertainty as to another point now to be mentioned. Ought the writer who deals with the works of nature to follow the plan adopted by the mathematicians in their astronomical demonstrations, and after considering the phenomena presented by animals, and their several parts, proceed subsequently to treat of the causes and the reason why; or ought he to follow some other method?

And when these questions are answered, there yet remains another. The causes concerned in the generation of the works of nature are, as we see, more than one. There is the final cause and there is the motor cause. Now we must decide which of these two causes comes first, which second. Plainly, however, that cause is the first which we call the final one. For this is the Reason, and the Reason forms the starting-point, alike in the works of art and in works of nature. For consider how the physician or how the builder sets about his work. He starts by forming for himself a definite picture, in the one case perceptible to mind, in the other to sense, of his end – the physician of health, the builder of a house – and this he holds forward as the reason and explanation of each subsequent step that he takes, and of his acting in this or that way as the case may be. Now in the works of nature the good end and the final cause is still more dominant than in works of art such as these, nor is necessity a factor with the same significance in them all; though almost all writers, while they try to refer their origin to this cause, do so without distinguishing the various senses in which the term necessity is used. For there is absolute necessity, manifested in eternal phenomena; and there is hypothetical necessity, manifested in everything that is generated by nature as in everything that is produced by art, be it a house or what it may. For if a house or other such final object is to be realized, it is necessary that such and such material shall exist; and it is necessary that first this then that shall be produced, and first this and then that set in motion, and so on in continuous succession, until the end and final result is reached, for the sake of which each prior thing is produced and exists. As with these productions of art, so also is it with the productions of nature. The mode of necessity, however, and the mode of ratiocination are different in natural science from what they are in the theoretical sciences; of which we have spoken elsewhere. For in the latter the starting-point is that which is; in the former that

which is to be. For it is that which is yet to be – health, let us say, or a man – that, owing to its being of such and such characters, necessitates the pre-existence or previous production of this and that antecedent; and not this or that antecedent which, because it exists or has been generated, makes it necessary that health or a man is in, or shall come into, existence. Nor is it possible to track back the series of necessary antecedents to a starting-point, of which you can say that, existing itself from eternity, it has determined their existence as its consequent. These however again, are matters that have been dealt with in another treatise. There too it was stated in what cases absolute and hypothetical necessity exist; in what cases also the proposition expressing hypothetical necessity is simply convertible, and what cause it is that determines this convertibility.

Another matter which must not be passed over without consideration is, whether the proper subject of our exposition is that with which the ancient writers concerned themselves, namely, what is the process of formation of each animal; or whether it is not rather, what are the characters of a given creature when formed. For there is no small difference between these two views. The best course appears to be that we should follow the method already mentioned, and begin with the phenomena presented by each group of animals, and, when this is done, proceed afterwards to state the causes of those phenomena, and to deal with their evolution. For elsewhere, as for instance in house building, this is the true sequence. The plan of the house, or the house, has this and that form; and because it has this and that form, therefore is its construction carried out in this or that manner. For the process of evolution is for the sake of the thing Anally evolved, and not this for the sake of the process. Empedocles, then, was in error when he said that many of the characters presented by animals were merely the results of incidental occurrences during their

development; for instance, that the backbone was divided as it is into vertebrae, because it happened to be broken owing to the contorted position of the foetus in the womb. In so saying he overlooked the fact that propagation implies a creative seed endowed with certain formative properties. Secondly, he neglected another fact, namely, that the parent animal pre-exists, not only in idea, but actually in time. For man is generated from man; and thus it is the possession of certain characters by the parent that determines the development of like characters in the child. The same statement holds good also for the operations of art, and even for those which are apparently spontaneous. For the same result as is produced by art may occur spontaneously. Spontaneity, for instance, may bring about the restoration of health. The products of art, however, require the pre-existence of an efficient cause homogeneous with themselves, such as the statuary's art, which must necessarily precede the statue; for this cannot possibly be produced spontaneously. Art indeed consists in the conception of the result to be produced before its realization in the material. As with spontaneity, so with chance; for this also produces the same result as art, and by the same process.

The fittest mode, then, of treatment is to say, a man has such and such parts, because the conception of a man includes their presence, and because they are necessary conditions of his existence, or, if we cannot quite say this, which would be best of all, then the next thing to it, namely, that it is either quite impossible for him to exist without them, or, at any rate, that it is better for him that they should be there; and their existence involves the existence of other antecedents. Thus we should say, because man is an animal with such and such characters, therefore is the process of his development necessarily such as it is; and therefore is it accomplished in such and such an order, this part being formed first, that next, and so on in succession;

and after a like fashion should we explain the evolution of all other works of nature.

Now that with which the ancient writers, who first philosophized about Nature, busied themselves, was the material principle and the material cause. They inquired what this is, and what its character; how the universe is generated out of it, and by what motor influence, whether, for instance, by antagonism or friendship, whether by intelligence or spontaneous action, the substratum of matter being assumed to have certain inseparable properties; fire, for instance, to have a hot nature, earth a cold one; the former to be light, the latter heavy. For even the genesis of the universe is thus explained by them. After a like fashion do they deal also with the development of plants and of animals. They say, for instance, that the water contained in the body causes by its currents the formation of the stomach and the other receptacles of food or of excretion; and that the breath by its passage breaks open the outlets of the nostrils; air and water being the materials of which bodies are made; for all represent nature as composed of such or similar substances.

But if men and animals and their several parts are natural phenomena, then the natural philosopher must take into consideration not merely the ultimate substances of which they are made, but also flesh, bone, blood, and all other homogeneous parts; not only these, but also the heterogeneous parts, such as face, hand, foot; and must examine how each of these comes to be what it is, and in virtue of what force. For to say what are the ultimate substances out of which an animal is formed, to state, for instance, that it is made of fire or earth, is no more sufficient than would be a similar account in the case of a couch or the like. For we should not be content with saying that the couch was made of bronze or wood or whatever it might be, but should try to describe its design or mode of

composition in preference to the material; or, if we did deal with the material, it would at any rate be with the concretion of material and form. For a couch is such and such a form embodied in this or that matter, or such and such a matter with this or that form; so that its shape and structure must be included in our description. For the formal nature is of greater importance than the material nature.

Does, then, configuration and colour constitute the essence of the various animals and of their several parts? For if so, what Democritus says will be strictly correct. For such appears to have been his notion. At any rate he says that it is evident to every one what form it is that makes the man, seeing that he is recognizable by his shape and colour. And yet a dead body has exactly the same configuration as a living one; but for all that is not a man. So also no hand of bronze or wood or constituted in any but the appropriate way can possibly be a hand in more than name. For like a physician in a painting, or like a flute in a sculpture, in spite of its name it will be unable to do the office which that name implies. Precisely in the same way no part of a dead body, such I mean as its eye or its hand, is really an eye or a hand. To say, then, that shape and colour constitute the animal is an inadequate statement, and is much the same as if a woodcarver were to insist that the hand he had cut out was really a hand. Yet the physiologists, when they give an account of the development and causes of the animal form, speak very much like such a craftsman. What, however, I would ask, are the forces by which the hand or the body was fashioned into its shape? The woodcarver will perhaps say, by the axe or the auger; the physiologist, by air and by earth. Of these two answers the artificer's is the better, but it is nevertheless insufficient. For it is not enough for him to say that by the stroke of his tool this part was formed into a concavity, that into a flat surface; but he must state the reasons why he struck his blow in such a way as to effect this, and what his final object

was; namely, that the piece of wood should develop eventually into this or that shape. It is plain, then, that the teaching of the old physiologists is inadequate, and that the true method is to state what the definitive characters are that distinguish the animal as a whole; to explain what it is both in substance and in form, and to deal after the same fashion with its several organs; in fact, to proceed in exactly the same way as we should do, were we giving a complete description of a couch.

If now this something that constitutes the form of the living being be the soul, or part of the soul, or something that without the soul cannot exist; as would seem to be the case, seeing at any rate that when the soul departs, what is left is no longer a living animal, and that none of the parts remain what they were before, excepting in mere configuration, like the animals that in the fable are turned into stone; if, I say, this be so, then it will come within the province of the natural philosopher to inform himself concerning the soul, and to treat of it, either in its entirety, or, at any rate, of that part of it which constitutes the essential character of an animal; and it will be his duty to say what this soul or this part of a soul is; and to discuss the attributes that attach to this essential character, especially as nature is spoken of in two senses, and the nature of a thing is either its matter or its essence; nature as essence including both the motor cause and the final cause. Now it is in the latter of these two senses that either the whole soul or some part of it constitutes the nature of an animal; and inasmuch as it is the presence of the soul that enables matter to constitute the animal nature, much more than it is the presence of matter which so enables the soul, the inquirer into nature is bound on every ground to treat of the soul rather than of the matter. For though the wood of which they are made constitutes the couch and the tripod, it only does so because it is capable of receiving such and such a form.

What has been said suggests the question, whether it is the whole soul or only some part of it, the consideration of which comes within the province of natural science. Now if it be of the whole soul that this should treat, then there is no place for any other philosophy beside it. For as it belongs in all cases to one and the same science to deal with correlated subjects – one and the same science, for instance, deals with sensation and with the objects of sense – and as therefore the intelligent soul and the objects of intellect, being correlated, must belong to one and the same science, it follows that natural science will have to include the whole universe in its province. But perhaps it is not the whole soul, nor all its parts collectively, that constitutes the source of motion; but there may be one part, identical with that in plants, which is the source of growth, another, namely the sensory part, which is the source of change of quality, while still another, and this not the intellectual part, is the source of locomotion. I say not the intellectual part; for other animals than man have the power of locomotion, but in none but him is there intellect. Thus then it is plain that it is not of the whole soul that we have to treat. For it is not the whole soul that constitutes the animal nature, but only some part or parts of it. Moreover, it is impossible that any abstraction can form a subject of natural science, seeing that everything that Nature makes is means to an end. For just as human creations are the products of art, so living objects are manifest in the products of an analogous cause or principle, not external but internal, derived like the hot and the cold from the environing universe. And that the heaven, if it had an origin, was evolved and is maintained by such a cause, there is therefore even more reason to believe, than that mortal animals so originated. For order and definiteness are much more plainly manifest in the celestial bodies than in our own frame; while change and chance are characteristic of the perishable things of earth. Yet there are some who, while they allow that every animal exists

and was generated by nature, nevertheless hold that the heaven was constructed to be what it is by chance and spontaneity; the heaven, in which not the faintest sign of haphazard or of disorder is discernible! Again, whenever there is plainly some final end, to which a motion tends should nothing stand in the way, we always say that such final end is the aim or purpose of the motion; and from this it is evident that there must be a something or other really existing, corresponding to what we call by the name of Nature. For a given germ does not give rise to any chance living being, nor spring from any chance one; but each germ springs from a definite parent and gives rise to a definite progeny. And thus it is the germ that is the ruling influence and fabricator of the offspring. For these it is by nature, the offspring being at any rate that which in nature will spring from it. At the same time the offspring is anterior to the germ; for germ and perfected progeny are related as the developmental process and the result. Anterior, however, to both germ and product is the organism from which the germ was derived. For every germ implies two organisms, the parent and the progeny. For germ or seed is both the seed of the organism from which it came, of the horse, for instance, from which it was derived, and the seed of the organism that will eventually arise from it, of the mule, for example, which is developed from the seed of the horse. The same seed then is the seed both of the horse and of the mule, though in different ways as here set forth. Moreover, the seed is potentially that which will spring from it, and the relation of potentiality to actuality we know.

There are then two causes, namely, necessity and the final end. For many things are produced, simply as the results of necessity. It may, however, be asked, of what mode of necessity are we speaking when we say this. For it can be of neither of those two modes which are set forth in the philosophical treatises. There is, however, the third mode, in such things at

any rate as are generated. For instance, we say that food is necessary; because an animal cannot possibly do without it. This third mode is what may be called hypothetical necessity. Here is another example of it. If a piece of wood is to be split with an axe, the axe must of necessity be hard; and, if hard, must of necessity be made of bronze or iron. Now exactly in the same way the body, which like the axe is an instrument – for both the body as a whole and its several parts individually have definite operations for which they are made – just in the same way, I say, the body, if it is to do its work, must of necessity be of such and such a character, and made of such and such materials.

It is plain then that there are two modes of causation, and that both of these must, so far as possible, be taken into account in explaining the works of nature, or that at any rate an attempt must be made to include them both; and that those who fail in this tell us in reality nothing about nature. For primary cause constitutes the nature of an animal much more than does its matter. There are indeed passages in which even Empedocles hits upon this, and following the guidance of fact, finds himself constrained to speak of the ratio (olugos) as constituting the essence and real nature of things. Such, for instance, is the case when he explains what is a bone. For he does not merely describe its material, and say it is this one element, or those two or three elements, or a compound of all the elements, but states the ratio (olugos) of their combination. As with a bone, so manifestly is it with the flesh and all other similar parts.

The reason why our predecessors failed in hitting upon this method of treatment was, that they were not in possession of the notion of essence, nor of any definition of substance. The first who came near it was Democritus, and he was far from adopting it as a necessary method in natural science, but was merely brought to it, spite of himself, by constraint of facts. In

the time of Socrates a nearer approach was made to the method. But at this period men gave up inquiring into the works of nature, and philosophers diverted their attention to political science and to the virtues which benefit mankind.

Of the method itself the following is an example. In dealing with respiration we must show that it takes place for such or such a final object; and we must also show that this and that part of the process is necessitated by this and that other stage of it. By necessity we shall sometimes mean hypothetical necessity, the necessity, that is, that the requisite antecedants shall be there, if the final end is to be reached; and sometimes absolute necessity, such necessity as that which connects substances and their inherent properties and characters. For the alternate discharge and re-entrance of heat and the inflow of air are necessary if we are to live. Here we have at once a necessity in the former of the two senses. But the alternation of heat and refrigeration produces of necessity an alternate admission and discharge of the outer air, and this is a necessity of the second kind.

In the foregoing we have an example of the method which we must adopt, and also an example of the kind of phenomena, the causes of which we have to investigate.

2

Some writers propose to reach the definitions of the ultimate forms of animal life by bipartite division. But this method is often difficult, and often impracticable.

Sometimes the final differentia of the subdivision is sufficient by itself, and the antecedent differentiae are mere surplusage.

Thus in the series Footed, Two-footed, Cleft-footed, the last term is all-expressive by itself, and to append the higher terms is only an idle iteration. Again it is not permissible to break up a natural group, Birds for instance, by putting its members under different bifurcations, as is done in the published dichotomies, where some birds are ranked with animals of the water, and others placed in a different class. The group Birds and the group Fishes happen to be named, while other natural groups have no popular names; for instance, the groups that we may call Sanguineous and Bloodless are not known popularly by any designations. If such natural groups are not to be broken up, the method of Dichotomy cannot be employed, for it necessarily involves such breaking up and dislocation. The group of the Many-footed, for instance, would, under this method, have to be dismembered, and some of its kinds distributed among land animals, others among water animals.

3

Again, privative terms inevitably form one branch of dichotomous division, as we see in the proposed dichotomies. But privative terms in their character of privatives admit of no subdivision. For there can be no specific forms of a negation, of Featherless for instance or of Footless, as there are of Feathered and of Footed. Yet a generic differentia must be subdivisible; for otherwise what is there that makes it generic rather than specific? There are to be found generic, that is specifically subdivisible, differentiae; Feathered for instance and Footed. For feathers are divisible into Barbed and Unbarbed, and feet into Manycleft, and Twocleft, like those of animals with bifid hoofs, and Uncleft or Undivided, like those of animals with solid hoofs. Now even with differentiae capable of this specific subdivision

it is difficult enough so to make the classification, as that each animal shall be comprehended in some one subdivision and in not more than one; but far more difficult, nay impossible, is it to do this, if we start with a dichotomy into two contradictories. (Suppose for instance we start with the two contradictories, Feathered and Unfeathered; we shall find that the ant, the glow-worm, and some other animals fall under both divisions.) For each differentia must be presented by some species. There must be some species, therefore, under the privative heading. Now specifically distinct animals cannot present in their essence a common undifferentiated element, but any apparently common element must really be differentiated. (Bird and Man for instance are both Two-footed, but their two-footedness is diverse and differentiated. So any two sanguineous groups must have some difference in their blood, if their blood is part of their essence.) From this it follows that a privative term, being insusceptible of differentiation, cannot be a generic differentia; for, if it were, there would be a common undifferentiated element in two different groups.

Again, if the species are ultimate indivisible groups, that is, are groups with indivisible differentiae, and if no differentia be common to several groups, the number of differentiae must be equal to the number of species. If a differentia though not divisible could yet be common to several groups, then it is plain that in virtue of that common differentia specifically distinct animals would fall into the same division. It is necessary then, if the differentiae, under which are ranged all the ultimate and indivisible groups, are specific characters, that none of them shall be common; for otherwise, as already said, specifically distinct animals will come into one and the same division. But this would violate one of the requisite conditions, which are as follows. No ultimate group must be included in more than a single division; different groups must not be included in the same division; and every group must be found in some division.

It is plain then that we cannot get at the ultimate specific forms of the animal, or any other, kingdom by bifurcate division. If we could, the number of ultimate differentiae would equal the number of ultimate animal forms. For assume an order of beings whose prime differentiae are White and Black. Each of these branches will bifurcate, and their branches again, and so on till we reach the ultimate differentiae, whose number will be four or some other power of two, and will also be the number of the ultimate species comprehended in the order.

(A species is constituted by the combination differentia and matter. For no part of an animal is purely material or purely immaterial; nor can a body, independently of its condition, constitute an animal or any of its parts, as has repeatedly been observed.)

Further, the differentiae must be elements of the essence, and not merely essential attributes. Thus if Figure is the term to be divided, it must not be divided into figures whose angles are equal to two right angles, and figures whose angles are together greater than two right angles. For it is only an attribute of a triangle and not part of its essence that its angles are equal to two right angles.

Again, the bifurcations must be opposites, like White and Black, Straight and Bent; and if we characterize one branch by either term, we must characterize the other by its opposite, and not, for example, characterize one branch by a colour, the other by a mode of progression, swimming for instance.

Furthermore, living beings cannot be divided by the functions common to body and soul, by Flying, for instance, and Walking, as we see them divided in the dichotomies already referred to. For some groups, Ants for instance, fall under both divisions, some ants flying while others do not. Similarly as regards the division into Wild and Tame; for it also would involve the

disruption of a species into different groups. For in almost all species in which some members are tame, there are other members that are wild. Such, for example, is the case with Men, Horses, Oxen, Dogs in India, Pigs, Goats, Sheep; groups which, if double, ought to have what they have not, namely, different appellations; and which, if single, prove that Wildness and Tameness do not amount to specific differences. And whatever single element we take as a basis of division the same difficulty will occur.

The method then that we must adopt is to attempt to recognize the natural groups, following the indications afforded by the instincts of mankind, which led them for instance to form the class of Birds and the class of Fishes, each of which groups combines a multitude of differentiae, and is not defined by a single one as in dichotomy. The method of dichotomy is either impossible (for it would put a single group under different divisions or contrary groups under the same division), or it only furnishes a single ultimate differentia for each species, which either alone or with its series of antecedents has to constitute the ultimate species.

If, again, a new differential character be introduced at any stage into the division, the necessary result is that the continuity of the division becomes merely a unity and continuity of agglomeration, like the unity and continuity of a series of sentences coupled together by conjunctive particles. For instance, suppose we have the bifurcation Feathered and Featherless, and then divide Feathered into Wild and Tame, or into White and Black. Tame and White are not a differentiation of Feathered, but are the commencement of an independent bifurcation, and are foreign to the series at the end of which they are introduced.

As we said then, we must define at the outset by multiplicity of differentiae. If we do so, privative terms will be available, which are unavailable to the dichotomist.

The impossibility of reaching the definition of any of the ultimate forms by dichotomy of the larger group, as some propose, is manifest also from the following considerations. It is impossible that a single differentia, either by itself or with its antecedents, shall express the whole essence of a species. (In saying a single differentia by itself I mean such an isolated differentia as Cleft-footed; in saying a single differentia with antecedent I mean, to give an instance, Manycleft-footed preceded by Cleft-footed. The very continuity of a series of successive differentiae in a division is intended to show that it is their combination that expresses the character of the resulting unit, or ultimate group. But one is misled by the usages of language into imagining that it is merely the final term of the series, Manycleft-footed for instance, that constitutes the whole differentia, and that the antecedent terms, Footed, Cleft-footed, are superfluous. Now it is evident that such a series cannot consist of many terms. For if one divides and subdivides, one soon reaches the final differential term, but for all that will not have got to the ultimate division, that is, to the species.) No single differentia, I repeat, either by itself or with its antecedents, can possibly express the essence of a species. Suppose, for example, Man to be the animal to be defined; the single differentia will be Cleft-footed, either by itself or with its antecedents, Footed and Two-footed. Now if man was nothing more than a Cleft-footed animal, this single differentia would duly represent his essence. But seeing that this is not the case, more differentiae than this one will necessarily be required to define him; and these cannot come under one division; for each single branch of a dichotomy ends in a single differentia, and cannot possibly include several differentiae belonging to one and the same animal.

It is impossible then to reach any of the ultimate animal forms by dichotomous division.

4

It deserves inquiry why a single name denoting a higher group was not invented by mankind, as an appellation to comprehend the two groups of Water animals and Winged animals. For even these have certain attributes in common. However, the present nomenclature is just. Groups that only differ in degree, and in the more or less of an identical element that they possess, are aggregated under a single class; groups whose attributes are not identical but analogous are separated. For instance, bird differs from bird by gradation, or by excess and defect; some birds have long feathers, others short ones, but all are feathered. Bird and Fish are more remote and only agree in having analogous organs; for what in the bird is feather, in the fish is scale. Such analogies can scarcely, however, serve universally as indications for the formation of groups, for almost all animals present analogies in their corresponding parts.

The individuals comprised within a species, such as Socrates and Coriscus, are the real existences; but inasmuch as these individuals possess one common specific form, it will suffice to state the universal attributes of the species, that is, the attributes common to all its individuals, once for all, as otherwise there will be endless reiteration, as has already been pointed out.

But as regards the larger groups – such as Birds – which comprehend many species, there may be a question. For on the one hand it may be urged that as the ultimate species represent the real existences, it will be well, if practicable, to examine

these ultimate species separately, just as we examine the species Man separately; to examine, that is, not the whole class Birds collectively, but the Ostrich, the Crane, and the other indivisible groups or species belonging to the class.

On the other hand, however, this course would involve repeated mention of the same attribute, as the same attribute is common to many species, and so far would be somewhat irrational and tedious. Perhaps, then, it will be best to treat generically the universal attributes of the groups that have a common nature and contain closely allied subordinate forms, whether they are groups recognized by a true instinct of mankind, such as Birds and Fishes, or groups not popularly known by a common appellation, but withal composed of closely allied subordinate groups; and only to deal individually with the attributes of a single species, when such species, man, for instance, and any other such, if such there be – stands apart from others, and does not constitute with them a larger natural group.

It is generally similarity in the shape of particular organs, or of the whole body, that has determined the formation of the larger groups. It is in virtue of such a similarity that Birds, Fishes, Cephalopoda, and Testacea have been made to form each a separate class. For within the limits of each such class, the parts do not differ in that they have no nearer resemblance than that of analogy – such as exists between the bone of man and the spine of fish – but differ merely in respect of such corporeal conditions as largeness smallness, softness hardness, smoothness roughness, and other similar oppositions, or, in one word, in respect of degree.

We have now touched upon the canons for criticizing the method of natural science, and have considered what is the most systematic and easy course of investigation; we have also dealt with division, and the mode of conducting it so as best to

attain the ends of science, and have shown why dichotomy is either impracticable or inefficacious for its professed purposes.

Having laid this foundation, let us pass on to our next topic.

5

Of things constituted by nature some are ungenerated, imperishable, and eternal, while others are subject to generation and decay. The former are excellent beyond compare and divine, but less accessible to knowledge. The evidence that might throw light on them, and on the problems which we long to solve respecting them, is furnished but scantily by sensation; whereas respecting perishable plants and animals we have abundant information, living as we do in their midst, and ample data may be collected concerning all their various kinds, if only we are willing to take sufficient pains. Both departments, however, have their special charm. The scanty conceptions to which we can attain of celestial things give us, from their excellence, more pleasure than all our knowledge of the world in which we live; just as a half glimpse of persons that we love is more delightful than a leisurely view of other things, whatever their number and dimensions. On the other hand, in certitude and in completeness our knowledge of terrestrial things has the advantage. Moreover, their greater nearness and affinity to us balances somewhat the loftier interest of the heavenly things that are the objects of the higher philosophy. Having already treated of the celestial world, as far as our conjectures could reach, we proceed to treat of animals, without omitting, to the best of our ability, any member of the kingdom, however ignoble. For if some have no graces to charm the sense, yet even these, by disclosing to intellectual perception the

artistic spirit that designed them, give immense pleasure to all who can trace links of causation, and are inclined to philosophy. Indeed, it would be strange if mimic representations of them were attractive, because they disclose the mimetic skill of the painter or sculptor, and the original realities themselves were not more interesting, to all at any rate who have eyes to discern the reasons that determined their formation. We therefore must not recoil with childish aversion from the examination of the humbler animals. Every realm of nature is marvellous: and as Heraclitus, when the strangers who came to visit him found him warming himself at the furnace in the kitchen and hesitated to go in, reported to have bidden them not to be afraid to enter, as even in that kitchen divinities were present, so we should venture on the study of every kind of animal without distaste; for each and all will reveal to us something natural and something beautiful. Absence of haphazard and conduciveness of everything to an end are to be found in Nature's works in the highest degree, and the resultant end of her generations and combinations is a form of the beautiful.

If any person thinks the examination of the rest of the animal kingdom an unworthy task, he must hold in like disesteem the study of man. For no one can look at the primordia of the human frame – blood, flesh, bones, vessels, and the like – without much repugnance. Moreover, when any one of the parts or structures, be it which it may, is under discussion, it must not be supposed that it is its material composition to which attention is being directed or which is the object of the discussion, but the relation of such part to the total form. Similarly, the true object of architecture is not bricks, mortar, or timber, but the house; and so the principal object of natural philosophy is not the material elements, but their composition, and the totality of the form, independently of which they have no existence.

The course of exposition must be first to state the attributes common to whole groups of animals, and then to attempt to give their explanation. Many groups, as already noticed, present common attributes, that is to say, in some cases absolutely identical affections, and absolutely identical organs, – feet, feathers, scales, and the like – while in other groups the affections and organs are only so far identical as that they are analogous. For instance, some groups have lungs, others have no lung, but an organ analogous to a lung in its place; some have blood, others have no blood, but a fluid analogous to blood, and with the same office. To treat of the common attributes in connexion with each individual group would involve, as already suggested, useless iteration. For many groups have common attributes. So much for this topic.

As every instrument and every bodily member subserves some partial end, that is to say, some special action, so the whole body must be destined to minister to some Plenary sphere of action. Thus the saw is made for sawing, for sawing is a function, and not sawing for the saw. Similarly, the body too must somehow or other be made for the soul, and each part of it for some subordinate function, to which it is adapted.

We have, then, first to describe the common functions, common, that is, to the whole animal kingdom, or to certain large groups, or to the members of a species. In other words, we have to describe the attributes common to all animals, or to assemblages, like the class of Birds, of closely allied groups differentiated by gradation, or to groups like Man not differentiated into subordinate groups. In the first case the common attributes may be called analogous, in the second generic, in the third specific.

When a function is ancillary to another, a like relation manifestly obtains between the organs which discharge these

functions; and similarly, if one function is prior to and the end of another, their respective organs will stand to each other in the same relation. Thirdly, the existence of these parts involves that of other things as their necessary consequents.

Instances of what I mean by functions and affections are Reproduction, Growth, Copulation, Waking, Sleep, Locomotion, and other similar vital actions. Instances of what I mean by parts are Nose, Eye, Face, and other so-called members or limbs, and also the more elementary parts of which these are made. So much for the method to be pursued. Let us now try to set forth the causes of all vital phenomena, whether universal or particular, and in so doing let us follow that order of exposition which conforms, as we have indicated, to the order of nature.

Book II

1

The nature and the number of the parts of which animals are severally composed are matters which have already been set forth in detail in the book of Researches about Animals. We have now to inquire what are the causes that in each case have determined this composition, a subject quite distinct from that dealt with in the Researches.

Now there are three degrees of composition; and of these the first in order, as all will allow, is composition out of what some

call the elements, such as earth, air, water, fire. Perhaps, however, it would be more accurate to say composition out of the elementary forces; nor indeed out of all of these, but out of a limited number of them, as defined in previous treatises. For fluid and solid, hot and cold, form the material of all composite bodies; and all other differences are secondary to these, such differences, that is, as heaviness or lightness, density or rarity, roughness or smoothness, and any other such properties of matter as there may be. second degree of composition is that by which the homogeneous parts of animals, such as bone, flesh, and the like, are constituted out of the primary substances. The third and last stage is the composition which forms the heterogeneous parts, such as face, hand, and the rest.

Now the order of actual development and the order of logical existence are always the inverse of each other. For that which is posterior in the order of development is antecedent in the order of nature, and that is genetically last which in nature is first.

(That this is so is manifest by induction; for a house does not exist for the sake of bricks and stones, but these materials for the sake of the house; and the same is the case with the materials of other bodies. Nor is induction required to show this. it is included in our conception of generation. For generation is a process from a something to a something; that which is generated having a cause in which it originates and a cause in which it ends. The originating cause is the primary efficient cause, which is something already endowed with tangible existence, while the final cause is some definite form or similar end; for man generates man, and plant generates plant, in each case out of the underlying material.)

In order of time, then, the material and the generative process must necessarily be anterior to the being that is generated; but in logical order the definitive character and form of each being

precedes the material. This is evident if one only tries to define the process of formation. For the definition of house-building includes and presupposes that of the house; but the definition of the house does not include nor presuppose that of house-building; and the same is true of all other productions. So that it must necessarily be that the elementary material exists for the sake of the homogeneous parts, seeing that these are genetically posterior to it, just as the heterogeneous parts are posterior genetically to them. For these heterogeneous parts have reached the end and goal, having the third degree of composition, in which degree generation or development often attains its final term.

Animals, then, are composed of homogeneous parts, and are also composed of heterogeneous parts. The former, however, exist for the sake of the latter. For the active functions and operations of the body are carried on by these; that is, by the heterogeneous parts, such as the eye, the nostril, the whole face, the fingers, the hand, and the whole arm. But inasmuch as there is a great variety in the functions and motions not only of aggregate animals but also of the individual organs, it is necessary that the substances out of which these are composed shall present a diversity of properties. For some purposes softness is advantageous, for others hardness; some parts must be capable of extension, others of flexion. Such properties, then, are distributed separately to the different homogeneous parts, one being soft another hard, one fluid another solid, one viscous another brittle; whereas each of the heterogeneous parts presents a combination of multifarious properties. For the hand, to take an example, requires one property to enable it to effect pressure, and another and different property for simple prehension. For this reason the active or executive parts of the body are compounded out of bones, sinews, flesh, and the like, but not these latter out of the former.

So far, then, as has yet been stated, the relations between these two orders of parts are determined by a final cause. We have, however, to inquire whether necessity may not also have a share in the matter; and it must be admitted that these mutual relations could not from the very beginning have possibly been other than they are. For heterogeneous parts can be made up out of homogeneous parts, either from a plurality of them, or from a single one, as is the case with some of the viscera which, varying in configuration, are yet, to speak broadly, formed from a single homogeneous substance; but that homogeneous substances should be formed out of a combination of heterogeneous parts is clearly an impossibility. For these causes, then, some parts of animals are simple and homogeneous, while others are composite and heterogeneous; and dividing the parts into the active or executive and the sensitive, each one of the former is, as before said, heterogeneous, and each one of the latter homogeneous. For it is in homogeneous parts alone that sensation can occur, as the following considerations show.

Each sense is confined to a single order of sensibles, and its organ must be such as to admit the action of that kind or order. But it is only that which is endowed with a property in posse that is acted on by that which has the like property in esse, so that the two are the same in kind, and if the latter is single so also is the former. Thus it is that while no physiologists ever dream of saying of the hand or face or other such part that one is earth, another water, another fire, they couple each separate sense-organ with a separate element, asserting this one to be air and that other to be fire.

Sensation, then, is confined to the simple or homogeneous parts. But, as might reasonably be expected, the organ of touch, though still homogeneous, is yet the least simple of all the sense-organs. For touch more than any other sense appears to

be correlated to several distinct kinds of objects, and to recognize more than one category of contrasts, heat and cold, for instance, solidity and fluidity, and other similar oppositions. Accordingly, the organ which deals with these varied objects is of all the sense-organs the most corporeal, being either the flesh, or the substance which in some animals takes the place of flesh.

Now as there cannot possibly be an animal without sensation, it follows as a necessary consequence that every animal must have some homogeneous parts; for these alone are capable of sensation, the heterogeneous parts serving for the active functions. Again, as the sensory faculty, the motor faculty, and the nutritive faculty are all lodged in one and the same part of the body, as was stated in a former treatise, it is necessary that the part which is the primary seat of these principles shall on the one hand, in its character of general sensory recipient, be one of the simple parts; and on the other hand shall, in its motor and active character, be one of the heterogeneous parts. For this reason it is the heart which in sanguineous animals constitutes this central part, and in bloodless animals it is that which takes the place of a heart. For the heart, like the other viscera, is one of the homogeneous parts; for, if cut up, its pieces are homogeneous in substance with each other. But it is at the same time heterogeneous in virtue of its definite configuration. And the same is true of the other so-called viscera, which are indeed formed from the same material as the heart. For all these viscera have a sanguineous character owing to their being situated upon vascular ducts and branches. For just as a stream of water deposits mud, so the various viscera, the heart excepted, are, as it were, deposits from the stream of blood in the vessels. And as to the heart, the very starting-point of the vessels, and the actual seat of the force by which the blood is first fabricated, it is but what one would naturally expect, that out of the selfsame nutriment of which it is the recipient its

own proper substance shall be formed. Such, then, are the reasons why the viscera are of sanguineous aspect; and why in one point of view they are homogeneous, in another heterogeneous.

2

Of the homogeneous parts of animals, some are soft and fluid, others hard and solid; and of the former some are fluid permanently, others only so long as they are in the living body. Such are blood, serum, lard, suet, marrow, semen, bile, milk when present, flesh, and their various analogues. For the parts enumerated are not to be found in all animals, some animals only having parts analogous to them. Of the hard and solid homogeneous parts bone, fish-spine, sinew, blood-vessel, are examples. The last of these points to a sub-division that may be made in the class of homogeneous parts. For in some of them the whole and a portion of the whole in one sense are designated by the same term – as, for example, is the case with blood-vessel and bit of blood-vessel – while in another sense they are not; but a portion of a heterogeneous part, such as face, in no sense has the same designation as the whole.

The first question to be asked is what are the causes to which these homogeneous parts owe their existence? The causes are various; and this whether the parts be solid or fluid. Thus one set of homogeneous parts represent the material out of which the heterogeneous parts are formed; for each separate organ is constructed of bones, sinews, flesh, and the like; which are either essential elements in its formation, or contribute to the proper discharge of its function. A second set are the nutriment of the first, and are invariably fluid, for all growth occurs at the

expense of fluid matter; while a third set are the residue of the second. Such, for instance, are the faeces and, in animals that have a bladder, the urine; the former being the dregs of the solid nutriment, the latter of the fluid.

Even the individual homogeneous parts present variations, which are intended in each case to render them more serviceable for their purpose. The variations of the blood may be selected to illustrate this. For different bloods differ in their degrees of thinness or thickness, of clearness or turbidity, of coldness or heat; and this whether we compare the bloods from different parts of the same individual or the bloods of different animals. For, in the individual, all the differences just enumerated distinguish the blood of the upper and of the lower halves of the body; and, dealing with classes, one section of animals is sanguineous, while the other has no blood, but only something resembling it in its place. As regards the results of such differences, the thicker and the hotter blood is, the more conducive is it to strength, while in proportion to its thinness and its coldness is its suitability for sensation and intelligence. A like distinction exists also in the fluid which is analogous to blood. This explains how it is that bees and other similar creatures are of a more intelligent nature than many sanguineous animals; and that, of sanguineous animals, those are the most intelligent whose blood is thin and cold. Noblest of all are those whose blood is hot, and at the same time thin and clear. For such are suited alike for the development of courage and of intelligence. Accordingly, the upper parts are superior in these respects to the lower, the male superior to the female, and the right side to the left. As with the blood so also with the other parts, homogeneous and heterogeneous alike. For here also such variations as occur must be held either to be related to the essential constitution and mode of life of the several animals, or, in other cases, to be merely matters of slightly better or slightly worse. Two animals, for instance, may have

eyes. But in one these eyes may be of fluid consistency, while in the other they are hard; and in one there may be eyelids, in the other no such appendages. In such a case, the fluid consistency and the presence of eyelids, which are intended to add to the accuracy of vision, are differences of degree. As to why all animals must of necessity have blood or something of a similar character, and what the nature of blood may be, these are matters which can only be considered when we have first discussed hot and cold. For the natural properties of many substances are referable to these two elementary principles; and it is a matter of frequent dispute what animals or what parts of animals are hot and what cold. For some maintain that water animals are hotter than such as live on land, asserting that their natural heat counterbalances the coldness of their medium; and again, that bloodless animals are hotter than those with blood, and females than males. Parmenides, for instance, and some others declare that women are hotter than men, and that it is the warmth and abundance of their blood which causes their menstrual flow, while Empedocles maintains the opposite opinion. Again, comparing the blood and the bile, some speak of the former as hot and of the latter as cold, while others invert the description. If there be this endless disputing about hot and cold, which of all things that affect our senses are the most distinct, what are we to think as to our other sensory impressions?

The explanation of the difficulty appears to be that the term 'hotter' is used in several senses; so that different statements, though in verbal contradiction with each other, may yet all be more or less true. There ought, then, to be some clear understanding as to the sense in which natural substances are to be termed hot or cold, solid or fluid. For it appears manifest that these are properties on which even life and death are largely dependent, and that they are moreover the causes of sleep and waking, of maturity and old age, of health and

disease; while no similar influence belongs to roughness and smoothness, to heaviness and lightness, nor, in short, to any other such properties of matter. That this should be so is but in accordance with rational expectation. For hot and cold, solid and fluid, as was stated in a former treatise, are the foundations of the physical elements.

Is then the term hot used in one sense or in many? To answer this we must ascertain what special effect is attributed to a hotter substance, and if there be several such, how many these may be. A body then is in one sense said to be hotter than another, if it impart a greater amount of heat to an object in contact with it. In a second sense, that is said to be hotter which causes the keener sensation when touched, and especially if the sensation be attended with pain. This criterion, however, would seem sometimes to be a false one; for occasionally it is the idiosyncrasy of the individual that causes the sensation to be painful. Again, of two things, that is the hotter which the more readily melts a fusible substance, or sets on fire an inflammable one. Again, of two masses of one and the same substance, the larger is said to have more heat than the smaller. Again, of two bodies, that is said to be the hotter which takes the longer time in cooling, as also we call that which is rapidly heated hotter than that which is long about it; as though the rapidity implied proximity and this again similarity of nature, while the want of rapidity implied distance and this again dissimilarity of nature. The term hotter is used then in all the various senses that have been mentioned, and perhaps in still more. Now it is impossible for one body to be hotter than another in all these different fashions. Boiling water for instance, though it is more scalding than flame, yet has no power of burning or melting combustible or fusible matter, while flame has. So again this boiling water is hotter than a small fire, and yet gets cold more rapidly and completely. For in fact fire never becomes cold; whereas water invariably does so. Boiling water, again, is hotter to the touch

than oil; yet it gets cold and solid more rapidly than this other fluid. Blood, again, is hotter to the touch than either water or oil, and yet coagulates before them. Iron, again, and stones and other similar bodies are longer in getting heated than water, but when once heated burn other substances with a much greater intensity. Another distinction is this. In some of the bodies which are called hot the heat is derived from without, while in others it belongs to the bodies themselves; and it makes a most important difference whether the heat has the former or the latter origin. For to call that one of two bodies the hotter, which is possessed of heat, we may almost say, accidentally and not of its own essence, is very much the same thing as if, finding that some man in a fever was a musician, one were to say that musicians are hotter than healthy men. Of that which is hot per se and that which is hot per accidens, the former is the slower to cool, while not rarely the latter is the hotter to the touch. The former again is the more burning of the two – flame, for instance, as compared with boiling water – while the latter, as the boiling water, which is hot per accidens, is the more heating to the touch. From all this it is clear that it is no simple matter to decide which of two bodies is the hotter. For the first may be the hotter in one sense, the second the hotter in another. Indeed in some of these cases it is impossible to say simply even whether a thing is hot or not. For the actual substratum may not itself be hot, but may be hot when coupled witb heat as an attribute, as would be the case if one attached a single name to hot water or hot iron. It is after this manner that blood is hot. In such cases, in those, that is, in which the substratum owes its heat to an external influence, it is plain that cold is not a mere privation, but an actual existence.

There is no knowing but that even fire may be another of these cases. For the substratum of fire may be smoke or charcoal, and though the former of these is always hot, smoke being an uprising vapour, yet the latter becomes cold when its flame is

extinguished, as also would oil and pinewood under similar circumstances. But even substances that have been burnt nearly all possess some heat, cinders, for example, and ashes, the dejections also of animals, and, among the excretions, bile; because some residue of heat has been left in them after their combustion. It is in another sense that pinewood and fat substances are hot; namely, because they rapidly assume the actuality of fire.

Heat appears to cause both coagulation and melting. Now such things as are formed merely of water are solidified by cold, while such as are formed of nothing but earth are solidified by fire. Hot substances again are solidified by cold, and, when they consist chiefly of earth, the process of solidification is rapid, and the resulting substance is insoluble; but, when their main constituent is water, the solid matter is again soluble. What kinds of substances, however, admit of being solidified, and what are the causes of solidification, are questions that have already been dealt with more precisely in another treatise.

In conclusion, then, seeing that the terms hot and hotter are used in many different senses, and that no one substance can be hotter than others in all these senses, we must, when we attribute this character to an object, add such further statements as that this substance is hotter per se, though that other is often hotter per accidens; or again, that this substance is potentially hot, that other actually so; or again, that this substance is hotter in the sense of causing a greater feeling of heat when touched, while that other is hotter in the sense of producing flame and burning. The term hot being used in all these various senses, it plainly follows that the term cold will also be used with like ambiguity.

So much then as to the signification of the terms hot and cold, hotter and colder.

3

In natural sequence we have next to treat of solid and fluid. These terms are used in various senses. Sometimes, for instance, they denote things that are potentially, at other times things that are actually, solid or fluid. Ice for example, or any other solidified fluid, is spoken of as being actually and accidentally solid, while potentially and essentially it is fluid. Similarly earth and ashes and the like, when mixed with water, are actually and accidentally fluid, but potentially and essentially are solid. Now separate the constituents in such a mixture and you have on the one hand the watery components to which its fluidity was due, and these are both actually and potentially fluid, and on the other hand the earthy components, and these are in every way solid; and it is to bodies that are solid in this complete manner that the term 'solid' is most properly and absolutely applicable. So also the opposite term 'fluld' is strictly and absolutely applicable to that only which is both potentially and actually fluid. The same remark applies also to hot bodies and to cold.

These distinctions, then, being laid down, it is plain that blood is essentially hot in so far as that heat is connoted in its name; just as if boiling water were denoted by a single term, boiling would be connoted in that term. But the substratum of blood, that which it is in substance while it is blood in form, is not hot. Blood then in a certain sense is essentially hot, and in another sense is not so. For heat is included in the definition of blood, just as whiteness is included in the definition of a white man, and so far therefore blood is essentially hot. But so far as blood becomes hot from some external influence, it is not hot essentially.

As with hot and cold, so also is it with solid and fluid. We can therefore understand how some substances are hot and fluid so long as they remain in the living body, but become perceptibly cold and coagulate so soon as they are separated from it; while others are hot and consistent while in the body, but when withdrawn under a change to the opposite condition, and become cold and fluid. Of the former blood is an example, of the latter bile; for while blood solidifies when thus separated, yellow bile under the same circumstances becomes more fluid. We must attribute to such substances the possession of opposite properties in a greater or less degree.

In what sense, then, the blood is hot and in what sense fluid, and how far it partakes of the opposite properties, has now been fairly explained. Now since everything that grows must take nourishment, and nutriment in all cases consists of fluid and solid substances, and since it is by the force of heat that these are concocted and changed, it follows that all living things, animals and plants alike, must on this account, if on no other, have a natural source of heat. This natural heat, moreover, must belong to many parts, seeing that the organs by which the various elaborations of the food are effected are many in number. For first of all there is the mouth and the parts inside the mouth, on which the first share in the duty clearly devolves, in such animals at least as live on food which requires disintegration. The mouth, however, does not actually concoct the food, but merely facilitates concoction; for the subdivision of the food into small bits facilitates the action of heat upon it. After the mouth come the upper and the lower abdominal cavities, and here it is that concoction is effected by the aid of natural heat. Again, just as there is a channel for the admission of the unconcocted food into the stomach, namely the mouth, and in some animals the so-called oesophagus, which is continuous with the mouth and reaches to the stomach, so must there also be other and more numerous channels by

which the concocted food or nutriment shall pass out of the stomach and intestines into the body at large, and to which these cavities shall serve as a kind of manger. For plants get their food from the earth by means of their roots; and this food is already elaborated when taken in, which is the reason why plants produce no excrement, the earth and its heat serving them in the stead of a stomach. But animals, with scarcely an exception, and conspicuously all such as are capable of locomotion, are provided with a stomachal sac, which is as it were an internal substitute for the earth. They must therefore have some instrument which shall correspond to the roots of plants, with which they may absorb their food from this sac, so that the proper end of the successive stages of concoction may at last be attained. The mouth then, its duty done, passes over the food to the stomach, and there must necessarily be something to receive it in turn from this. This something is furnished by the bloodvessels, which run throughout the whole extent of the mesentery from its lowest part right up to the stomach. A description of these will be found in the treatises on Anatomy and Natural History. Now as there is a receptacle for the entire matter taken as food, and also a receptacle for its excremental residue, and again a third receptacle, namely the vessels, which serve as such for the blood, it is plain that this blood must be the final nutritive material in such animals as have it; while in bloodless animals the same is the case with the fluid which represents the blood. This explains why the blood diminishes in quantity when no food is taken, and increases when much is consumed, and also why it becomes healthy and unhealthy according as the food is of the one or the other character. These facts, then, and others of a like kind, make it plain that the purpose of the blood in sanguineous animals is to subserve the nutrition of the body. They also explain why no more sensation is produced by touching the blood than by touching one of the excretions or the food, whereas when the

flesh is touched sensation is produced. For the blood is not continuous nor united by growth with the flesh, but simply lies loose in its receptacle, that is in the heart and vessels. The manner in which the parts grow at the expense of the blood, and indeed the whole question of nutrition, will find a more suitable place for exposition in the treatise on Generation, and in other writings. For our present purpose all that need be said is that the blood exists for the sake of nutrition, that is the nutrition of the parts; and with this much let us therefore content ourselves.

4

What are called fibres are found in the blood of some animals but not of all. There are none, for instance, in the blood of deer and of roes; and for this reason the blood of such animals as these never coagulates. For one part of the blood consists mainly of water and therefore does not coagulate, this process occurring only in the other and earthy constituent, that is to say in the fibres, while the fluid part is evaporating.

Some at any rate of the animals with watery blood have a keener intellect than those whose blood is of an earthier nature. This is due not to the coldness of their blood, but rather to its thinness and purity; neither of which qualities belongs to the earthy matter. For the thinner and purer its fluid is, the more easily affected is an animal's sensibility. Thus it is that some bloodless animals, notwithstanding their want of blood, are yet more intelligent than some among the sanguineous kinds. Such for instance, as already said, is the case with the bee and the tribe of ants, and whatever other animals there may be of a like nature. At the same time too great an excess of water makes

animals timorous. For fear chills the body; so that in animals whose heart contains so watery a mixture the way is prepared for the operation of this emotion. For water is congealed by cold. This also explains why bloodless animals are, as a general rule, more timorous than such as have blood, so that they remain motionless, when frightened, and discharge their excretions, and in some instances change colour. Such animals, on the other hand, as have thick and abundant fibres in their blood are of a more earthy nature, and of a choleric temperament, and liable to bursts of passion. For anger is productive of heat; and solids, when they have been made hot, give off more heat than fluids. The fibres therefore, being earthy and solid, are turned into so many hot embers in the blood, like the embers in a vapour-bath, and cause ebullition in the fits of passion.

This explains why bulls and boars are so choleric and so passionate. For their blood is exceedingly rich in fibres, and the bull's at any rate coagulates more rapidly than that of any other animal. If these fibres, that is to say if the earthy constituents of which we are speaking, are taken out of the blood, the fluid that remains behind will no longer coagulate; just as the watery residue of mud will not coagulate after removal of the earth. But if the fibres are left the fluid coagulates, as also does mud, under the influence of cold. For when the heat is expelled by the cold, the fluid, as has been already stated, passes off with it by evaporation, and the residue is dried up and solidified, not by heat but by cold. So long, however, as the blood is in the body, it is kept fluid by animal heat.

The character of the blood affects both the temperament and the sensory faculties of animals in many ways. This is indeed what might reasonably be expected, seeing that the blood is the material of which the whole body is made. For nutriment supplies the material, and the blood is the ultimate nutriment.

It makes then a considerable difference whether the blood be hot or cold, thin or thick, turbid or clear.

The watery part of the blood is serum; and it is watery, either owing to its not being yet concocted, or owing to its having become corrupted; so that one part of the serum is the resultant of a necessary process, while another part is material intended to serve for the formation of the blood.

5

The differences between lard and suet correspond to differences of blood. For both are blood concocted into these forms as a result of abundant nutrition, being that surplus blood that is not expended on the fleshy part of the body, and is of an easily concocted and fatty character. This is shown by the unctuous aspect of these substances; for such unctuous aspect in fluids is due to a combination of air and fire. It follows from what has been said that no non-sanguineous animals have either lard or suet; for they have no blood. Among sanguineous animals those whose blood is dense have suet rather than lard. For suet is of an earthy nature, that is to say, it contains but a small proportion of water and is chiefly composed of earth; and this it is that makes it coagulate, just as the fibrous matter of blood coagulates, or broths which contain such fibrous matter. Thus it is that in those horned animals that have no front teeth in the upper jaw the fat consists of suet. For the very fact that they have horns and huckle-bones shows that their composition is rich in this earthy element; for all such appurtenances are solid and earthy in character. On the other hand in those hornless animals that have front teeth in both jaws, and whose feet are divided into toes, there is no suet, but

in its place lard; and this, not being of an earthy character, neither coagulates nor dries up into a friable mass.

Both lard and suet when present in moderate amount are beneficial; for they contribute to health and strength, while they are no hindrance to sensation. But when they are present in great excess, they are injurious and destructive. For were the whole body formed of them it would perish. For an animal is an animal in virtue of its sensory part, that is in virtue of its flesh, or of the substance analogous to flesh. But the blood, as before stated, is not sensitive; as therefore is neither lard nor suet, seeing that they are nothing but concocted blood. Were then the whole body composed of these substances, it would be utterly without sensation. Such animals, again, as are excessively fat age rapidly. For so much of their blood is used in forming fat, that they have but little left; and when there is but little blood the way is already open for decay. For decay may be said to be deficiency of blood, the scantiness of which renders it liable, like all bodies of small bulk, to be injuriously affected by any chance excess of heat or cold. For the same reason fat animals are less prolific than others. For that part of the blood which should go to form semen and seed is used up in the production of lard and suet, which are nothing but concocted blood; so that in these animals there is either no reproductive excretion at all, or only a scanty amount.

6

So much then of blood and serum, and of lard and suet. Each of these has been described, and the purposes told for which they severally exist. The marrow also is of the nature of blood, and not, as some think, the germinal force of the semen. That this is

the case is quite evident in very young animals. For in the embryo the marrow of the bones has a blood-like appearance, which is but natural, seeing that the parts are all constructed out of blood, and that it is on blood that the embryo is nourished. But, as the young animal grows up and ripens into maturity, the marrow changes its colour, just as do the external parts and the viscera. For the viscera also in animals, so long as they are young, have each and all a blood-like look, owing to the large amount of this fluid which they contain.

The consistency of the marrow agrees with that of the fat. For when the fat consists of lard, then the marrow also is unctuous and lard-like; but when the blood is converted by concoction into suet, and does not assume the form of lard, then the marrow also has a suety character. In those animals, therefore, that have horns and are without upper front teeth, the marrow has the character of suet; while it takes the form of lard in those that have front teeth in both jaws, and that also have the foot divided into toes. What has ben said hardly applies to the spinal marrow. For it is necessary that this shall be continuous and extend without break through the whole backbone, inasmuch as this bone consists of separate vertebrae. But were the spinal marrow either of unctuous fat or of suet, it could not hold together in such a continuous mass as it does, but would either be too fluid or too frangible.

There are some animals that can hardly be said to have any marrow. These are those whose bones are strong and solid, as is the case with the lion. For in this animal the marrow is so utterly insignificant that the bones look as though they had none at all. However, as it is necessary that animals shall have bones or something analogous to them, such as the fish-spines of water-animals, it is also a matter of necessity that some of these bones shall contain marrow; for the substance contained within the bones is the nutriment out of which these are

formed. Now the universal nutriment, as already stated, is blood; and the blood within the bone, owing to the heat which is developed in it from its being thus surrounded, undergoes concoction, and self-concocted blood is suet or lard; so that it is perfectly intelligible how the marrow within the bone comes to have the character of these substances. So also it is easy to understand why, in those animals that have strong and compact bones, some of these should be entirely void of marrow, while the rest contain but little of it; for here the nutriment is spent in forming the bones.

Those animals that have fish-spines in place of bones have no other marrow than that of the chine. For in the first place they have naturally but a small amount of blood; and secondly the only hollow fish-spine is that of the chine. In this then marrow is formed; this being the only spine in which there is space for it, and, moreover, being the only one which owing to its division into parts requires a connecting bond. This too is the reason why the marrow of the chine, as already mentioned, is somewhat different from that of other bones. For, having to act the part of a clasp, it must be of glutinous character, and at the same time sinewy so as to admit of stretching.

Such then are the reasons for the existence of marrow, in those animals that have any, and such its nature. It is evidently the surplus of the sanguineous nutriment apportioned to the bones and fish-spines, which has undergone concoction owing to its being enclosed within them.

7

From the marrow we pass on in natural sequence to the brain. For there are many who think that the brain itself consists of

marrow, and that it forms the commencement of that substance, because they see that the spinal marrow is continuous with it. In reality the two may be said to be utterly opposite to each other in character. For of all the parts of the body there is none so cold as the brain; whereas the marrow is of a hot nature, as is plainly shown by its fat and unctuous character. Indeed this is the very reason why the brain and spinal marrow are continuous with each other. For, wherever the action of any part is in excess, nature so contrives as to set by it another part with an excess of contrary action, so that the excesses of the two may counterbalance each other. Now that the marrow is hot is clearly shown by many indications. The coldness of the brain is also manifest enough. For in the first place it is cold even to the touch; and, secondly, of all the fluid parts of the body it is the driest and the one that has the least blood; for in fact it has no blood at all in its proper substance. This brain is not residual matter, nor yet is it one of the parts which are anatomically continuous with each other; but it has a character peculiar to itself, as might indeed be expected. That it has no continuity with the organs of sense is plain from simple inspection, and is still more clearly shown by the fact, that, when it is touched, no sensation is produced; in which respect it resembles the blood of animals and their excrement. The purpose of its presence in animals is no less than the preservation of the whole body. For some writers assert that the soul is fire or some such force. This, however, is but a rough and inaccurate assertion; and it would perhaps be better to say that the soul is incorporate in some substance of a fiery character. The reason for this being so is that of all substances there is none so suitable for ministering to the operations of the soul as that which is possessed of heat. For nutrition and the imparting of motion are offices of the soul, and it is by heat that these are most readily effected. To say then that the soul is fire is much the same thing as to confound the auger or the saw with the

carpenter or his craft, simply because the work is wrought by the two in conjunction. So far then this much is plain, that all animals must necessarily have a certain amount of heat. But as all influences require to be counterbalanced, so that they may be reduced to moderation and brought to the mean (for in the mean, and not in either extreme, lies the true and rational position), nature has contrived the brain as a counterpoise to the region of the heart with its contained heat, and has given it to animals to moderate the latter, combining in it the properties of earth and water. For this reason it is, that every sanguineous animal has a brain; whereas no bloodless creature has such an organ, unless indeed it be, as the Poulp, by analogy. For where there is no blood, there in consequence there is but little heat. The brain, then, tempers the heat and seething of the heart. In order, however, that it may not itself be absolutely without heat, but may have a moderate amount, branches run from both blood-vessels, that is to say from the great vessel and from what is called the aorta, and end in the membrane which surrounds the brain; while at the same time, in order to prevent any injury from the heat, these encompassing vessels, instead of being few and large, are numerous and small, and their blood scanty and clear, instead of being abundant and thick. We can now understand why defluxions have their origin in the head, and occur whenever the parts about the brain have more than a due proportion of coldness. For when the nutriment steams upwards through the blood-vessels, its refuse portion is chilled by the influence of this region, and forms defluxions of phlegm and serum. We must suppose, to compare small things with great, that the like happens here as occurs in the production of showers. For when vapour steams up from the earth and is carried by the heat into the upper regions, so soon as it reaches the cold air that is above the earth, it condenses again into water owing to the refrigeration, and falls back to the earth as rain. These, however, are matters which may be suitably

considered in the Principles of Diseases, so far as natural philosophy has anything to say to them.

It is the brain again – or, in animals that have no brain, the part analogous to it – which is the cause of sleep. For either by chilling the blood that streams upwards after food, or by some other similar influences, it produces heaviness in the region in which it lies (which is the reason why drowsy persons hang the head), and causes the heat to escape downwards in company with the blood. It is the accumulation of this in excess in the lower region that produces complete sleep, taking away the power of standing upright from those animals to whom that posture is natural, and from the rest the power of holding up the head. These, however, are matters which have been separately considered in the treatises on Sensation and on Sleep.

That the brain is a compound of earth and water is shown by what occurs when it is boiled. For, when so treated, it turns hard and solid, inasmuch as the water is evaporated by the heat, and leaves the earthy part behind. Just the same occurs when pulse and other fruits are boiled. For these also are hardened by the process, because the water which enters into their composition is driven off and leaves the earth, which is their main constituent, behind.

Of all animals, man has the largest brain in proportion to his size; and it is larger in men than in women. This is because the region of the heart and of the lung is hotter and richer in blood in man than in any other animal; and in men than in women. This again explains why man, alone of animals, stands erect. For the heat, overcoming any opposite inclination, makes growth take its own line of direction, which is from the centre of the body upwards. It is then as a counterpoise to his excessive heat that in man's brain there is this superabundant fluidity

and coldness; and it is again owing to this superabundance that the cranial bone, which some call the Bregma, is the last to become solidified; so long does evaporation continue to occur through it under the influence of heat. Man is the only sanguineous animal in which this takes place. Man, again, has more sutures in his skull than any other animal, and the male more than the female. The explanation is again to be found in the greater size of the brain, which demands free ventilation, proportionate to its bulk. For if the brain be either too fluid or too solid, it will not perform its office, but in the one case will freeze the blood, and in the other will not cool it at all; and thus will cause disease, madness, and death. For the cardiac heat and the centre of life is most delicate in its sympathies, and is immediately sensitive to the slightest change or affection of the blood on the outer surface of the brain.

The fluids which are present in the animal body at the time of birth have now nearly all been considered. Amongst those that appear only at a later period are the residua of the food, which include the deposits of the belly and also those of the bladder. Besides these there is the semen and the milk, one or the other of which makes its appearance in appropriate animals. Of these fluids the excremental residua of the food may be suitably discussed by themselves, when we come to examine and consider the subject of nutrition. Then will be the time to explain in what animals they are found, and what are the reasons for their presence. Similarly all questions concerning the semen and the milk may be dealt with in the treatise on Generation, for the former of these fluids is the very starting-point of the generative process, and the latter has no other ground of existence than generative purposes.

8

We have now to consider the remaining homogeneous parts, and will begin with flesh, and with the substance that, in animals that have no flesh, takes its place. The reason for so beginning is that flesh forms the very basis of animals, and is the essential constituent of their body. Its right to this precedence can also be demonstrated logically. For an animal is by our definition something that has sensibility and chief of all the primary sensibility, which is that of Touch; and it is the flesh, or analogous substance, which is the organ of this sense. And it is the organ, either in the same way as the pupil is the organ of sight, that is it constitutes the primary organ of the sense; or it is the organ and the medium through which the object acts combined, that is it answers to the pupil with the whole transparent medium attached to it. Now in the case of the other senses it was impossible for nature to unite the medium with the sense-organ, nor would such a junction have served any purpose; but in the case of touch she was compelled by necessity to do so. For of all the sense-organs that of touch is the only one that has corporeal substance, or at any rate it is more corporeal than any other, and its medium must be corporeal like itself.

It is obvious also to sense that it is for the sake of the flesh that all the other parts exist. By the other parts I mean the bones, the skin, the sinews, and the blood-vessels, and, again, the hair and the various kinds of nails, and anything else there may be of a like character. Thus the bones are a contrivance to give security to the soft parts, to which purpose they are adapted by their hardness; and in animals that have no bones the same office is fulfilled by some analogous substance, as by fishspine in some fishes, and by cartilage in others.

Now in some animals this supporting substance is situated within the body, while in some of the bloodless species it is placed on the outside. The latter is the case in all the Crustacea, as the Carcini (Crabs) and the Carabi (Prickly Lobsters); it is the case also in the Testacea, as for instance in the several species known by the general name of oysters. For in all these animals the fleshy substance is within, and the earthy matter, which holds the soft parts together and keeps them from injury, is on the outside. For the shell not only enables the soft parts to hold together, but also, as the animal is bloodless and so has but little natural warmth, surrounds it, as a chaufferette does the embers, and keeps in the smouldering heat. Similar to this seems to be the arrangement in another and distinct tribe of animals, namely the Tortoises, including the Chelone and the several kinds of Emys. But in Insects and in Cephalopods the plan is entirely different, there being moreover a contrast between these two themselves. For in neither of these does there appear to be any bony or earthy part, worthy of notice, distinctly separated from the rest of the body. Thus in the Cephalopods the main bulk of the body consists of a soft flesh-like substance, or rather of a substance which is intermediate to flesh and sinew, so as not to be so readily destructible as actual flesh. I call this substance intermediate to flesh and sinew, because it is soft like the former, while it admits of stretching like the latter. Its cleavage, however, is such that it splits not longitudinally, like sinew, but into circular segments, this being the most advantageous condition, so far as strength is concerned. These animals have also a part inside them corresponding to the spinous bones of fishes. For instance, in the Cuttle-fishes there is what is known as the os sepiae, and in the Calamaries there is the so-called gladius. In the Poulps, on the other hand, there is no such internal part, because the body, or, as it is termed in them, the head, forms but a short sac, whereas it is of considerable length in the other two; and it was

this length which led nature to assign to them their hard support, so as to ensure their straightness and inflexibility; just as she has assigned to sanguineous animals their bones or their fish-spines, as the case may be. To come now to Insects. In these the arrangement is quite different from that of the Cephalopods; quite different also from that which obtains in sanguineous animals, as indeed has been already stated. For in an insect there is no distinction into soft and hard parts, but the whole body is hard, the hardness, however, being of such a character as to be more flesh-like than bone, and more earthy and bone-like than flesh. The purpose of this is to make the body of the insect less liable to get broken into pieces.

9

There is a resemblance between the osseous and the vascular systems; for each has a central part in which it begins, and each forms a continuous whole. For no bone in the body exists as a separate thing in itself, but each is either a portion of what may be considered a continuous whole, or at any rate is linked with the rest by contact and by attachments; so that nature may use adjoining bones either as though they were actually continuous and formed a single bone, or, for purposes of flexure, as though they were two and distinct. And similarly no blood-vessel has in itself a separate individuality; but they all form parts of one whole. For an isolated bone, if such there were, would in the first place be unable to perform the office for the sake of which bones exist; for, were it discontinuous and separated from the rest by a gap, it would be perfectly unable to produce either flexure or extension; nor only so, but it would actually be injurious, acting like a thorn or an arrow lodged in the flesh. Similarly if a vessel were isolated, and not continuous with the

vascular centre, it would be unable to retain the blood within it in a proper state. For it is the warmth derived from this centre that hinders the blood from coagulating; indeed the blood, when withdrawn from its influence, becomes manifestly putrid. Now the centre or origin of the blood-vessels is the heart, and the centre or origin of the bones, in all animals that have bones, is what is called the chine. With this all the other bones of the body are in continuity; for it is the chine that holds together the whole length of an animal and preserves its straightness. But since it is necessary that the body of an animal shall bend during locomotion, this chine, while it is one in virtue of the continuity of its parts, yet its division into vertebrae is made to consist of many segments. It is from this chine that the bones of the limbs, in such animals as have these parts, proceed, and with it they are continuous, being fastened together by the sinews where the limbs admit of flexure, and having their extremities adapted to each other, either by the one being hollowed and the other rounded, or by both being hollowed and including between them a hucklebone, as a connecting bolt, so as to allow of flexure and extension. For without some such arrangement these movements would be utterly impossible, or at any rate would be performed with great difficulty. There are some joints, again, in which the lower end of the one bone and the upper end of the other are alike in shape. In these cases the bones are bound together by sinews, and cartilaginous pieces are interposed in the joint, to serve as a kind of padding, and prevent the two extremities from grating against each other.

Round about the bones, and attached to them by thin fibrous bands, grow the fleshy parts, for the sake of which the bones themselves exist. For just as an artist, when he is moulding an animal out of clay or other soft substance, takes first some solid body as a basis, and round this moulds the clay, so also has nature acted in fashioning the animal body out of flesh. Thus we find all the fleshy parts, with one exception, supported by

bones, which serve, when the parts are organs of motion, to facilitate flexure, and, when the parts are motionless, act as a protection. The ribs, for example, which enclose the chest are intended to ensure the safety of the heart and neighbouring viscera. The exception of which mention was made is the belly. The walls of this are in all animals devoid of bones; in order that there may be no hindrance to the expansion which necessarily occurs in this part after a meal, nor, in females, any interference with the growth of the foetus, which is lodged here.

Now the bones of viviparous animals, of such, that is, as are not merely externally but also internally viviparous, vary but very little from each other in point of strength, which in all of them is considerable. For the Vivipara in their bodily proportions are far above other animals, and many of them occasionally grow to an enormous size, as is the case in Libya and in hot and dry countries generally. But the greater the bulk of an animal, the stronger, the bigger, and the harder, are the supports which it requires; and comparing the big animals with each other, this requirement will be most marked in those that live a life of rapine. Thus it is that the bones of males are harder than those of females; and the bones of flesh-eaters, that get their food by fighting, are harder than those of Herbivora. Of this the Lion is an example; for so hard are its bones, that, when struck, they give off sparks, as though they were stones. It may be mentioned also that the Dolphin, in as much as it is viviparous, is provided with bones and not with fish-spines.

In those sanguineous animals, on the other hand, that are oviparous, the bones present successive slight variations of character. Thus in Birds there are bones, but these are not so strong as the bones of the Vivipara. Then come the Oviparous fishes, where there is no bone, but merely fish-spine. In the Serpents too the bones have the character of fish-spine, excepting in the very large species, where the solid foundation

of the body requires to be stronger, in order that the animal itself may be strong, the same reason prevailing as in the case of the Vivipara. Lastly, in the Selachia, as they are called, the fish-spines are replaced by cartilage. For it is necessary that the movements of these animals shall be of an undulating character; and this again requires the framework that supports the body to be made of a pliable and not of a brittle substance. Moreover, in these Selachia nature has used all the earthy matter on the skin; and she is unable to allot to many different parts one and the same superfluity of material. Even in viviparous animals many of the bones are cartilaginous. This happens in those parts where it is to the advantage of the surrounding flesh that its solid base shall be soft and mucilaginous. Such, for instance, is the case with the ears and nostrils; for in projecting parts, such as these, brittle substances would soon get broken. Cartilage and bone are indeed fundamentally the same thing, the differences between them being merely matters of degree. Thus neither cartilage nor bone, when once cut off, grows again. Now the cartilages of these land animals are without marrow, that is without any distinctly separate marrow. For the marrow, which in bones is distinctly separate, is here mixed up with the whole mass, and gives a soft and mucilaginous consistence to the cartilage. But in the Selachia the chine, though it is cartilaginous, yet contains marrow; for here it stands in the stead of a bone.

Very nearly resembling the bones to the touch are such parts as nails, hoofs, whether solid or cloven, horns, and the beaks of birds, all of which are intended to serve as means of defence. For the organs which are made out of these substances, and which are called by the same names as the substances themselves, the organ hoof, for instance, and the organ horn, are contrivances to ensure the preservation of the animals to which they severally belong. In this class too must be reckoned the teeth, which in some animals have but a single function,

namely the mastication of the food, while in others they have an additional office, namely to serve as weapons; as is the case with all animals that have sharp interfitting teeth or that have tusks. All these parts are necessarily of solid and earthy character; for the value of a weapon depends on such properties. Their earthy character explains how it is that all such parts are more developed in four-footed vivipara than in man. For there is always more earth in the composition of these animals than in that of the human body. However, not only all these parts but such others as are nearly connected with them, skin for instance, bladder, membrane, hairs, feathers, and their analogues, and any other similar parts that there may be, will be considered farther on with the heterogeneous parts. There we shall inquire into the causes which produce them, and into the objects of their presence severally in the bodies of animals. For, as with the heterogeneous parts, so with these, it is from a consideration of their functions that alone we can derive any knowledge of them. The reason for dealing with them at all in this part of the treatise, and classifying them with the homogeneous parts, is that under one and the same name are confounded the entire organs and the substances of which they are composed. But of all these substances flesh and bone form the basis. Semen and milk were also passed over when we were considering the homogeneous fluids. For the treatise on Generation will afford a more suitable place for their examination, seeing that the former of the two is the very foundation of the thing generated, while the latter is its nourishment.

10

Let us now make, as it were, a fresh beginning, and consider the heterogeneous parts, taking those first which are the first in importance. For in all animals, at least in all the perfect kinds, there are two parts more essential than the rest, namely the part which serves for the ingestion of food, and the part which serves for the discharge of its residue. For without food growth and even existence is impossible. Intervening again between these two parts there is invariably a third, in which is lodged the vital principle. As for plants, though they also are included by us among things that have life, yet are they without any part for the discharge of waste residue. For the food which they absorb from the ground is already concocted, and they give off as its equivalent their seeds and fruits. Plants, again, inasmuch as they are without locomotion, present no great variety in their heterogeneous parts. For, where the functions are but few, few also are the organs required to effect them. The configuration of plants is a matter then for separate consideration. Animals, however, that not only live but feel, present a greater multiformity of parts, and this diversity is greater in some animals than in others, being most varied in those to whose share has fallen not mere life but life of high degree. Now such an animal is man. For of all living beings with which we are acquainted man alone partakes of the divine, or at any rate partakes of it in a fuller measure than the rest. For this reason, then, and also because his external parts and their forms are more familiar to us than those of other animals, we must speak of man first; and this the more fitly, because in him alone do the natural parts hold the natural position; his upper part being turned towards that which is upper in the universe. For, of all animals, man alone stands erect.

In man, then, the head is destitute of flesh; this being the necessary consequence of what has already been stated

concerning the brain. There are, indeed, some who hold that the life of man would be longer than it is, were his head more abundantly furnished with flesh; and they account for the absence of this substance by saying that it is intended to add to the perfection of sensation. For the brain they assert to be the organ of sensation; and sensation, they say, cannot penetrate to parts that are too thickly covered with flesh. But neither part of this statement is true. On the contrary, were the region of the brain thickly covered with flesh, the very purpose for which animals are provided with a brain would be directly contravened. For the brain would itself be heated to excess and so unable to cool any other part; and, as to the other half of their statement, the brain cannot be the cause of any of the sensations, seeing that it is itself as utterly without feeling as any one of the excretions. These writers see that certain of the senses are located in the head, and are unable to discern the reason for this; they see also that the brain is the most peculiar of all the animal organs; and out of these facts they form an argument, by which they link sensation and brain together. It has, however, already been clearly set forth in the treatise on Sensation, that it is the region of the heart that constitutes the sensory centre. There also it was stated that two of the senses, namely touch and taste, are manifestly in immediate connexion with the heart; and that as regards the other three, namely hearing, sight, and the centrally placed sense of smell, it is the character of their sense-organs which causes them to be lodged as a rule in the head. Vision is so placed in all animals. But such is not invariably the case with hearing or with smell. For fishes and the like hear and smell, and yet have no visible organs for these senses in the head; a fact which demonstrates the accuracy of the opinion here maintained. Now that vision, whenever it exists, should be in the neighbourhood of the brain is but what one would rationally expect. For the brain is fluid and cold, and vision is of the nature of water, water being of all

transparent substances the one most easily confined. Moreover it cannot but necessarily be that the more precise senses will have their precision rendered still greater if ministered to by parts that have the purest blood. For the motion of the heat of blood destroys sensory activity. For these reasons the organs of the precise senses are lodged in the head.

It is not only the fore part of the head that is destitute of flesh, but the hind part also. For, in all animals that have a head, it is this head which more than any other part requires to be held up. But, were the head heavily laden with flesh, this would be impossible; for nothing so burdened can be held upright. This is an additional proof that the absence of flesh from the head has no reference to brain sensation. For there is no brain in the hinder part of the head, and yet this is as much without flesh as is the front.

In some animals hearing as well as vision is lodged in the region of the head. Nor is this without a rational explanation. For what is called the empty space is full of air, and the organ of hearing is, as we say, of the nature of air. Now there are channels which lead from the eyes to the blood-vessels that surround the brain; and similarly there is a channel which leads back again from each ear and connects it with the hinder part of the head. But no part that is without blood is endowed with sensation, as neither is the blood itself, but only some one of the parts that are formed of blood.

The brain in all animals that have one is placed in the front part of the head; because the direction in which sensation acts is in front; and because the heart, from which sensation proceeds, is in the front part of the body; and lastly because the instruments of sensation are the blood-containing parts, and the cavity in the posterior part of the skull is destitute of blood-vessels.

As to the position of the sense-organs, they have been arranged by nature in the following well-ordered manner. The organs of hearing are so placed as to divide the circumference of the head into two equal halves; for they have to hear not only sounds which are directly in line with themselves, but sounds from all quarters. The organs of vision are placed in front, because sight is exercised only in a straight line, and moving as we do in a forward direction it is necessary that we should see before us, in the direction of our motion. Lastly, the organs of smell are placed with good reason between the eyes. For as the body consists of two parts, a right half and a left, so also each organ of sense is double. In the case of touch this is not apparent, the reason being that the primary organ of this sense is not the flesh or analogous part, but lies internally. In the case of taste, which is merely a modification of touch and which is placed in the tongue, the fact is more apparent than in the case of touch, but still not so manifest as in the case of the other senses. However, even in taste it is evident enough; for in some animals the tongue is plainly forked. The double character of the sensations is, however, more conspicuous in the other organs of sense. For there are two ears and two eyes, and the nostrils, though joined together, are also two. Were these latter otherwise disposed, and separated from each other as are the ears, neither they nor the nose in which they are placed would be able to perform their office. For in such animals as have nostrils olfaction is effected by means of inspiration, and the organ of inspiration is placed in front and in the middle line. This is the reason why nature has brought the two nostrils together and placed them as the central of the three sense-organs, setting them side by side on a level with each other, to avail themselves of the inspiratory motion. In other animals than man the arrangement of these sense-organs is also such as is adapted in each case to the special requirements.

11

For instance, in quadrupeds the ears stand out freely from the head and are set to all appearance above the eyes. Not that they are in reality above the eyes; but they seem to be so, because the animal does not stand erect, but has its head hung downwards. This being the usual attitude of the animal when in motion, it is of advantage that its ears shall be high up and movable; for by turning themselves about they can the better take in sounds from every quarter.

12

In birds, on the other hand, there are no ears, but only the auditory passages. This is because their skin is hard and because they have feathers instead of hairs, so that they have not got the proper material for the formation of ears. Exactly the same is the case with such oviparous quadrupeds as are clad with scaly plates, and the same explanation applies to them. There is also one of the viviparous quadrupeds, namely the seal, that has no ears but only the auditory passages. The explanation of this is that the seal, though a quadruped, is a quadruped of stunted formation.

13

Men, and Birds, and Quadrupeds, viviparous and oviparous alike, have their eyes protected by lids. In the Vivipara there are

two of these; and both are used by these animals not only in closing the eyes, but also in the act of blinking; whereas the oviparous quadrupeds, and the heavy-bodied birds as well as some others, use only the lower lid to close the eye; while birds blink by means of a membrane that issues from the canthus. The reason for the eyes being thus protected is that nature has made them of fluid consistency, in order to ensure keenness of vision. For had they been covered with hard skin, they would, it is true, have been less liable to get injured by anything falling into them from without, but they would not have been sharp-sighted. It is then to ensure keenness of vision that the skin over the pupil is fine and delicate; while the lids are superadded as a protection from injury. It is as a still further safeguard that all these animals blink, and man most of all; this action (which is not performed from deliberate intention but from a natural instinct) serving to keep objects from falling into the eyes; and being more frequent in man than in the rest of these animals, because of the greater delicacy of his skin. These lids are made of a roll of skin; and it is because they are made of skin and contain no flesh that neither they, nor the similarly constructed prepuce, unite again when once cut.

As to the oviparous quadrupeds, and such birds as resemble them in closing the eye with the lower lid, it is the hardness of the skin of their heads which makes them do so. For such birds as have heavy bodies are not made for flight; and so the materials which would otherwise have gone to increase the growth of the feathers are diverted thence, and used to augment the thickness of the skin. Birds therefore of this kind close the eye with the lower lid; whereas pigeons and the like use both upper and lower lids for the purpose. As birds are covered with feathers, so oviparous quadrupeds are covered with scaly plates; and these in all their forms are harder than hairs, so that the skin also to which they belong is harder than the skin of hairy animals. In these animals, then, the skin on

the head is hard, and so does not allow of the formation of an upper eyelid, whereas lower down the integument is of a flesh-like character, so that the lower lid can be thin and extensible.

The act of blinking is performed by the heavy-bodied birds by means of the membrane already mentioned, and not by this lower lid. For in blinking rapid motion is required, and such is the motion of this membrane, whereas that of the lower lid is slow. It is from the canthus that is nearest to the nostrils that the membrane comes. For it is better to have one starting-point for nictitation than two; and in these birds this starting-point is the junction of eye and nostrils, an anterior starting-point being preferable to a lateral one. Oviparous quadrupeds do not blink in like manner as the birds; for, living as they do on the ground, they are free from the necessity of having eyes of fluid consistency and of keen sight, whereas these are essential requisites for birds, inasmuch as they have to use their eyes at long distances. This too explains why birds with talons, that have to search for prey by eye from aloft, and therefore soar to greater heights than other birds, are sharpsighted; while common fowls and the like, that live on the ground and are not made for flight, have no such keenness of vision. For there is nothing in their mode of life which imperatively requires it.

Fishes and Insects and the hard-skinned Crustacea present certain differences in their eyes, but so far resemble each other as that none of them have eyelids. As for the hard-skinned Crustacea it is utterly out of the question that they should have any; for an eyelid, to be of use, requires the action of the skin to be rapid. These animals then have no eyelids and, in default of this protection, their eyes are hard, just as though the lid were attached to the surface of the eye, and the animal saw through it. Inasmuch, however, as such hardness must necessarily blunt the sharpness of vision, nature has endowed the eyes of Insects, and still more those of Crustacea, with mobility (just as she has

given some quadrupeds movable ears), in order that they may be able to turn to the light and catch its rays, and so see more plainly. Fishes, however, have eyes of a fluid consistency. For animals that move much about have to use their vision at considerable distances. If now they live on land, the air in which they move is transparent enough. But the water in which fishes live is a hindrance to sharp sight, though it has this advantage over the air, that it does not contain so many objects to knock against the eyes. The risk of collision being thus small, nature, who makes nothing in vain, has given no eyelids to fishes, while to counterbalance the opacity of the water she has made their eyes of fluid consistency.

14

All animals that have hairs on the body have lashes on the eyelids; but birds and animals with scale-like plates, being hairless, have none. The Libyan ostrich, indeed, forms an exception; for, though a bird, it is furnished with eyelashes. This exception, however, will be explained hereafter. Of hairy animals, man alone has lashes on both lids. For in quadrupeds there is a greater abundance of hair on the back than on the under side of the body; whereas in man the contrary is the case, and the hair is more abundant on the front surface than on the back. The reason for this is that hair is intended to serve as a protection to its possessor. Now, in quadrupeds, owing to their inclined attitude, the under or anterior surface does not require so much protection as the back, and is therefore left comparatively bald, in spite of its being the nobler of the two sides. But in man, owing to his upright attitude, the anterior and posterior surfaces of the body are on an equality as regards need of protection. Nature therefore has assigned the protective

covering to the nobler of the two surfaces; for invariably she brings about the best arrangement of such as are possible. This then is the reason that there is no lower eyelash in any quadruped; though in some a few scattered hairs sprout out under the lower lid. This also is the reason that they never have hair in the axillae, nor on the pubes, as man has. Their hair, then, instead of being collected in these parts, is either thickly set over the whole dorsal surface, as is the case for instance in dogs, or, sometimes, forms a mane, as in horses and the like, or as in the male lion where the mane is still more flowing and ample. So, again, whenever there is a tail of any length, nature decks it with hair, with long hair if the stem of the tail be short, as in horses, with short hair if the stem be long, regard also being had to the condition of the rest of the body. For nature invariably gives to one part what she subtracts from another. Thus when she has covered the general surface of an animal's body with an excess of hair, she leaves a deficiency in the region of the tail. This, for instance, in the case with bears.

No animal has so much hair on the head as man. This, in the first place, is the necessary result of the fluid character of his brain, and of the presence of so many sutures in his skull. For wherever there is the most fluid and the most heat, there also must necessarily occur the greatest outgrowth. But, secondly, the thickness of the hair in this part has a final cause, being intended to protect the head, by preserving it from excess of either heat or cold. And as the brain of man is larger and more fluid than that of any other animal, it requires a proportionately greater amount of protection. For the more fluid a substance is, the more readily does it get excessively heated or excessively chilled, while substances of an opposite character are less liable to such injurious affections.

These, however, are matters which by their close connexion with eyelashes have led us to digress from our real topic,

namely the cause to which these lashes owe their existence. We must therefore defer any further remarks we may have to make on these matters till the proper occasion arises and then return to their consideration.

15

Both eyebrows and eyelashes exist for the protection of the eyes; the former that they may shelter them, like the eaves of a house, from any fluids that trickle down from the head; the latter to act like the palisades which are sometimes placed in front of enclosures, and keep out any objects which might otherwise get in. The brows are placed over the junction of two bones, which is the reason that in old age they often become so bushy as to require cutting. The lashes are set at the terminations of small blood-vessels. For the vessels come to an end where the skin itself terminates; and, in all places where these endings occur, the exudation of moisture of a corporeal character necessitates the growth of hairs, unless there be some operation of nature which interferes, by diverting the moisture to another purpose.

16

Viviparous quadrupeds, as a rule, present no great variety of form in the organ of smell. In those of them, however, whose jaws project forwards and taper to a narrow end, so as to form what is called a snout, the nostrils are placed in this projection, there being no other available plan; while, in the rest, there is a

more definite demarcation between nostrils and jaws. But in no animal is this part so peculiar as in the elephant, where it attains an extraordinary and strength. For the elephant uses its nostril as a hand; this being the instrument with which it conveys food, fluid and solid alike, to its mouth. With it, too, it tears up trees, coiling it round their stems. In fact it applies it generally to the purposes of a hand. For the elephant has the double character of a land animal, and of one that lives in swamps. Seeing then that it has to get its food from the water, and yet must necessarily breathe, inasmuch as it is a land animal and has blood; seeing, also, that its excessive weight prevents it from passing rapidly from water to land, as some other sanguineous vivipara that breathe can do, it becomes necessary that it shall be suited alike for life in the water and for life on dry land. just then as divers are sometimes provided with instruments for respiration, through which they can draw air from above the water, and thus may remain for a long time under the sea, so also have elephants been furnished by nature with their lengthened nostril; and, whenever they have to traverse the water, they lift this up above the surface and breathe through it. For the elephant's proboscis, as already said, is a nostril. Now it would have been impossible for this nostril to have the form of a proboscis, had it been hard and incapable of bending. For its very length would then have prevented the animal from supplying itself with food, being as great an impediment as the of certain oxen, that are said to be obliged to walk backwards while they are grazing. It is therefore soft and flexible, and, being such, is made, in addition to its own proper functions, to serve the office of the fore-feet; nature in this following her wonted plan of using one and the same part for several purposes. For in polydactylous quadrupeds the fore-feet are intended not merely to support the weight of the body, but to serve as hands. But in elephants, though they must be reckoned polydactylous, as their foot has neither cloven nor

solid hoof, the fore-feet, owing to the great size and weight of the body, are reduced to the condition of mere supports; and indeed their slow motion and unfitness for bending make them useless for any other purpose. A nostril, then, is given to the elephant for respiration, as to every other animal that has a lung, and is lengthened out and endowed with its power of coiling because the animal has to remain for considerable periods of time in the water, and is unable to pass thence to dry ground with any rapidity. But as the feet are shorn of their full office, this same part is also, as already said, made by nature to supply their place, and give such help as otherwise would be rendered by them.

As to other sanguineous animals, the Birds, the Serpents, and the Oviparous quadrupeds, in all of them there are the nostril-holes, placed in front of the mouth; but in none are there any distinctly formed nostrils, nothing in fact which can be called nostrils except from a functional point of view. A bird at any rate has nothing which can properly be called a nose. For its so-called beak is a substitute for jaws. The reason for this is to be found in the natural conformation of birds. For they are winged bipeds; and this makes it necessary that their heads and neck shall be of light weight; just as it makes it necessary that their breast shall be narrow. The beak therefore with which they are provided is formed of a bone-like substance, in order that it may serve as a weapon as well as for nutritive purposes, but is made of narrow dimensions to suit the small size of the head. In this beak are placed the olfactory passages. But there are no nostrils; for such could not possibly be placed there.

As for those animals that have no respiration, it has already been explained why it is that they are without nostrils, and perceive odours either through gills, or through a blowhole, or, if they are insects, by the hypozoma; and how the power of smelling depends, like their motion, upon the innate spirit of

their bodies, which in all of them is implanted by nature and not introduced from without.

Under the nostrils are the lips, in such sanguineous animals, that is, as have teeth. For in birds, as already has been said, the purposes of nutrition and defence are fulfilled by a bonelike beak, which forms a compound substitute for teeth and lips. For supposing that one were to cut off a man's lips, unite his upper teeth together, and similarly his under ones, and then were to lengthen out the two separate pieces thus formed, narrowing them on either side and making them project forwards, supposing, I say, this to be done, we should at once have a bird-like beak.

The use of the lips in all animals except man is to preserve and guard the teeth; and thus it is that the distinctness with which the lips are formed is in direct proportion to the degree of nicety and perfection with which the teeth are fashioned. In man the lips are soft and flesh-like and capable of separating from each other. Their purpose, as in other animals, is to guard the teeth, but they are more especially intended to serve a higher office, contributing in common with other parts to man's faculty of speech. For just as nature has made man's tongue unlike that of other animals, and, in accordance with what I have said is her not uncommon practice, has used it for two distinct operations, namely for the perception of savours and for speech, so also has she acted with regard to the lips, and made them serve both for speech and for the protection of the teeth. For vocal speech consists of combinations of the letters, and most of these would be impossible to pronounce, were the lips not moist, nor the tongue such as it is. For some letters are formed by closures of the lips and others by applications of the tongue. But what are the differences presented by these and what the nature and extent of such differences, are questions to which answers must be sought from those who are versed in metrical science. It was

necessary that the two parts which we are discussing should, in conformity with the requirements, be severally adapted to fulfil the office mentioned above, and be of appropriate character. Therefore are they made of flesh, and flesh is softer in man than in any other animal, the reason for this being that of all animals man has the most delicate sense of touch.

17

The tongue is placed under the vaulted roof of the mouth. In land animals it presents but little diversity. But in other animals it is variable, and this whethe+r we compare them as a class with such as live on land, or compare their several species with each other. It is in man that the tongue attains its greatest degree of freedom, of softness, and of breadth; the object of this being to render it suitable for its double function. For its softness fits it for the perception of savours, a sense which is more delicate in man than in any other animal, softness being most impressionable by touch, of which sense taste is but a variety. This same softness again, together with its breadth, adapts it for the articulation of letters and for speech. For these qualities, combined with its freedom from attachment, are those which suit it best for advancing and retiring in every direction. That this is so is plain, if we consider the case of those who are tongue-tied in however slight a degree. For their speech is indistinct and lisping; that is to say there are certain letters which they cannot pronounce. In being broad is comprised the possibility of becoming narrow; for in the great the small is included, but not the great in the small.

What has been said explains why, among birds, those that are most capable of pronouncing letters are such as have the

broadest tongues; and why the viviparous and sanguineous quadrupeds, where the tongue is hard and thick and not free in its motions, have a very limited vocal articulation. Some birds have a considerable variety of notes. These are the smaller kinds. But it is the birds with talons that have the broader tongues. All birds use their tongues to communicate with each other. But some do this in a greater degree than the rest; so that in some cases it even seems as though actual instruction were imparted from one to another by its agency. These, however, are matters which have already been discussed in the Researches concerning Animals.

As to those oviparous and sanguineous animals that live not in the air but on the earth, their tongue in most cases is tied down and hard, and is therefore useless for vocal purposes; in the serpents, however, and in the lizards it is long and forked, so as to be suited for the perception of savours. So long indeed is this part in serpents, that though small while in the mouth it can be protruded to a great distance. In these animals it is forked and has a fine and hair-like extremity, because of their great liking for dainty food. For by this arrangement they derive a twofold pleasure from savours, their gustatory sensation being as it were doubled.

Even some bloodless animals have an organ that serves for the perception of savours; and in sanguineous animals such an organ is invariably variably For even in such of these as would seem to an ordinary observer to have nothing of the kind, some of the fishes for example, there is a kind of shabby representative of a tongue, much like what exists in river crocodiles. In most of these cases the apparent absence of the part can be rationally explained on some ground or other. For in the first place the interior of the mouth in animals of this character is invariably spinous. Secondly, in water animals there is but short space of time for the perception of savours, and as

the use of this sense is thus of short duration, shortened also is the separate part which subserves it. The reason for their food being so rapidly transmitted to the stomach is that they cannot possibly spend any time in sucking out the juices; for were they to attempt to do so, the water would make its way in during the process. Unless therefore one pulls their mouth very widely open, the projection of this part is quite invisible. The region exposed by thus opening the mouth is spinous; for it is formed by the close apposition of the gills, which are of a spinous character.

In crocodiles the immobility of the lower jaw also contributes in some measure to stunt the development of the tongue. For the crocodile's tongue is adherent to the lower jaw. For its upper and lower jaws are, as it were, inverted, it being the upper jaw which in other animals is the immovable one. The tongue, however, on this animal is not attached to the upper jaw, because that would interfere with the ingestion of food, but adheres to the lower jaw, because this is, as it were, the upper one which has changed its place. Moreover, it is the crocodile's lot, though a land animal, to live the life of a fish, and this again necessarily involves an indistinct formation of the part in question.

The roof of the mouth resembles flesh, even in many of the fishes; and in some of the river species, as for instance in the fishes known as Cyprini, is so very flesh-like and soft as to be taken by careless observers for a tongue. The tongue of fishes, however, though it exists as a separate part, is never formed with such distinctness as this, as has been already explained. Again, as the gustatory sensibility is intended to serve animals in the selection of food, it is not diffused equally over the whole surface of the tongue-like organ, but is placed chiefly in the tip; and for this reason it is the tip which is the only part of the tongue separated in fishes from the rest of the mouth. As all

animals are sensible to the pleasure derivable from food, they all feel a desire for it. For the object of desire is the pleasant. The part, however, by which food produces the sensation is not precisely alike in all of them, but while in some it is free from attachments, in others, where it is not required for vocal pur, poses, it is adherent. In some again it is hard, in others soft or flesh-like. Thus even the Crustacea, the Carabi for instance and the like, and the Cephalopods, such as the Sepias and the Poulps, have some such part inside the mouth. As for the Insects, some of them have the part which serves as tongue inside the mouth, as is the case with ants, and as is also the case with many Testacea, while in others it is placed externally. In this latter case it resembles a sting, and is hollow and spongy, so as to serve at one and the same time for the tasting and for the sucking up of nutriment. This is plainly to be seen in flies and bees and all such animals, and likewise in some of the Testacea. In the Purpurae, for instance, so strong is this part that it enables them to bore holes through the hard covering of shell-fish, of the spiral snails, for example, that are used as bait to catch them. So also the gad-flies and cattle-flies can pierce through the skin of man, and some of them even through the skins of other animals. Such, then, in these animals is the nature of the tongue, which is thus as it were the counterpart of the elephant's nostril. For as in the elephant the nostril is used as a weapon, so in these animals the tongue serves as a sting.

In all other animals the tongue agrees with description already given.

Book III

1

We have next to consider the teeth, and with these the mouth, that is the cavity which they enclose and form. The teeth have one invariable office, namely the reduction of food; but besides this general function they have other special ones, and these differ in different groups. Thus in some animals the teeth serve as weapons; but this with a distinction. For there are offensive weapons and there are defensive weapons; and while in some animals, as the wild Carnivora, the teeth answer both purposes, in many others, both wild and domesticated, they serve only for defence. In man the teeth are admirably constructed for their general office, the front ones being sharp, so as to cut the food into bits, and the hinder ones broad and flat, so as to grind it to a pulp; while between these and separating them are the dog-teeth, which, in accordance with the rule that the mean partakes of both extremes, share in the characters of those on either side, being broad in one part but sharp in another. Similar distinctions of shape are presented by the teeth of other animals, with the exception of those whose teeth are one and all of the sharp kind. In man, however, the number and the character even of these sharp teeth have been mainly determined by the requirements of speech. For the front teeth of man contribute in many ways to the formation of letter-sounds.

In some animals, however, the teeth, as already said, serve merely for the reduction of food. When, besides this, they serve as offensive and defensive weapons, they may either be formed into tusks, as for instance is the case in swine, or may be sharp-

pointed and interlock with those of the opposite jaw, in which case the animal is said to be saw-toothed. The explanation of this latter arrangement is as follows. The strength of such an animal is in its teeth, and these depend for their efficiency on their sharpness. In order, then, to prevent their getting blunted by mutual friction, such of them as serve for weapons fit into each other's interspaces, and are so kept in proper condition. No animal that has sharp interfitting teeth is at the same time furnished with tusks. For nature never makes anything superfluous or in vain. She gives, therefore, tusks to such animals as strike in fighting, and serrated teeth to such as bite. Sows, for instance, have no tusks, and accordingly sows bite instead of striking.

A general principle must here be noted, which will be found applicable not only in this instance but in many others that will occur later on. Nature allots each weapon, offensive and defensive alike, to those animals alone that can use it; or, if not to them alone, to them in a more marked degree; and she allots it in its most perfect state to those that can use it best; and this whether it be a sting, or a spur, or horns, or tusks, or what it may of a like kind.

Thus as males are stronger and more choleric than females, it is in males that such parts as those just mentioned are found, either exclusively, as in some species, or more fully developed, as in others. For though females are of course provided with such parts as are no less necessary to them than to males, the parts, for instance, which subserve nutrition, they have even these in an inferior degree, and the parts which answer no such necessary purpose they do not possess at all. This explains why stags have horns, while does have none; why the horns of cows are different from those of bulls, and, similarly, the horns of ewes from those of rams. It explains also why the females are often without spurs in species where the males are provided

with them, and accounts for similar facts relating to all other such parts.

All fishes have teeth of the serrated form, with the single exception of the fish known as the Scarus. In many of them there are teeth even on the tongue and on the roof of the mouth. The reason for this is that, living as they do in the water, they cannot but allow this fluid to pass into the mouth with the food. The fluid thus admitted they must necessarily discharge again without delay. For were they not to do so, but to retain it for a time while triturating the food, the water would run into their digestive cavities. Their teeth therefore are all sharp, being adapted only for cutting, and are numerous and set in many parts, that their abundance may serve in lieu of any grinding faculty, to mince the food into small bits. They are also curved, because these are almost the only weapons which fishes possess.

In all these offices of the teeth the mouth also takes its part; but besides these functions it is subservient to respiration, in all such animals as breathe and are cooled by external agency. For nature, as already said, uses the parts which are common to all animals for many special purposes, and this of her own accord. Thus the mouth has one universal function in all animals alike, namely its alimentary office; but in some, besides this, the special duty of serving as a weapon is attached to it; in others that of ministering to speech; and again in many, though not in all, the office of respiration. All these functions are thrown by nature upon one single organ, the construction of which she varies so as to suit the variations of office. Therefore it is that in some animals the mouth is contracted, while in others it is of wide dimensions. The contracted form belongs to such animals as use the mouth merely for nutritive, respiratory, and vocal purposes; whereas in such as use it as a means of defence it has a wide gape. This is its invariable form in such animals as are

saw-toothed. For seeing that their mode of warfare consists in biting, it is advantageous to them that their mouth shall have a wide opening; for the wider it opens, the greater will be the extent of the bite, and the more numerous will be the teeth called into play.

What has just been said applies to fishes as well as to other animals; and thus in such of them as are carnivorous, and made for biting, the mouth has a wide gape; whereas in the rest it is small, being placed at the extremity of a tapering snout. For this form is suited for their purposes, while the other would be useless.

In birds the mouth consists of what is called the beak, which in them is a substitute for lips and teeth. This beak presents variations in harmony with the functions and protective purposes which it serves. Thus in those birds that are called Crooked-clawed it is invariably hooked, inasmuch as these birds are carnivorous, and eat no kind of vegetable food whatsoever. For this form renders it serviceable to them in obtaining the mastery over their prey, and is better suited for deeds of violence than any other. Moreover, as their weapons of offence consist of this beak and of their claws, these latter also are more crooked in them than in the generality of birds. Similarly in each other kind of bird the beak is suited to the mode of life. Thus, in woodpeckers it is hard and strong, as also in crows and birds of crowlike habit, while in the smaller birds it is delicate, so as to be of use in collecting seeds and picking up minute animals. In such birds, again, as eat herbage, and such as live about marshes – those, for example, that swim and have webbed feet – the bill is broad, or adapted in some other way to the mode of life. For a broad bill enables a bird to dig into the ground with ease, just as, among quadrupeds, does the broad snout of the pig, an animal which, like the birds in question, lives on roots. Moreover, in these root-eating birds and in some

others of like habits of life, the tips of the bill end in hard points, which gives them additional facility in dealing with herbaceous food.

The several parts which are set on the head have now, pretty nearly all, been considered. In man, however, the part which lies between the head and the neck is called the face, this name, (prosopon) being, it would seem, derived from the function of the part. For as man is the only animal that stands erect, he is also the only one that looks directly in front (proso) and the only one whose voice is emitted in that direction.

2

We have now to treat of horns; for these also, when present, are appendages of the head. They exist in none but viviparous animals; though in some ovipara certain parts are metaphorically spoken of as horns, in virtue of a certain resemblance. To none of such parts, however, does the proper office of a horn belong; for they are never used, as are the horns of vivipara, for purposes which require strength, whether it be in self-protection or in offensive strife. So also no polydactylous animal is furnished with horns. For horns are defensive weapons, and these polydactylous animals possess other means of security. For to some of them nature has given claws, to others teeth suited for combat, and to the rest some other adequate defensive appliance. There are horns, however, in most of the cloven-hoofed animals, and in some of those that have a solid hoof, serving them as an offensive weapon, and in some cases also as a defensive one. There are horns also in all animals that have not been provided by nature with some other means of security; such means, for instance, as speed, which

has been given to horses; or great size, as in camels; for excessive bulk, such as has been given to these animals, and in a still greater measure to elephants, is sufficient in itself to protect an animal from being destroyed by others. Other animals again are protected by the possession of tusks; and among these are the swine, though they have a cloven hoof.

All animals again, whose horns are but useless appendages, have been provided by nature with some additional means of security. Thus deer are endowed with speed; for the large size and great branching of their horns makes these a source of detriment rather than of profit to their possessors. Similarly endowed are the Bubalus and gazelle; for though these animals will stand up against some enemies and defend themselves with their horns, yet they run away from such as are fierce and pugnacious. The Bonasus again, whoe horns curve inwards towards each other, is provided with a means of protection in the discharge of its excrement; and of this it avails itself when frightened. There are some other animals besides the Bonasus that have a similar mode of defence. In no case, however, does nature ever give more than one adequate means of protection to one and the same animal.

Most of the animals that have horns are cloven-hoofed; but the Indian ass, as they call it, is also reported to be horned, though its hoof is solid.

Again as the body, so far as regards its organs of motion, consists of two distinct parts, the right and the left, so also and for like reasons the horns of animals are, in the great majority of cases, two in number. Still there are some that have but a single horn; the Oryx, for instance, and the so-called Indian ass; in the former of which the hoof is cloven, while in the latter it is solid. In such animals the horn is set in the centre of the head; for as the middle belongs equally to both extremes, this

arrangement is the one that comes nearest to each side having its own horn.

Again, it would appear consistent with reason that the single horn should go with the solid rather than with the cloven hoof. For hoof, whether solid or cloven, is of the same nature as horn; so that the two naturally undergo division simultaneously and in the same animals. Again, since the division of the cloven hoof depends on deficiency of material, it is but rationally consistent, that nature, when she gave an animal an excess of material for the hoofs, which thus became solid, should have taken away something from the upper parts and so made the animal to have but one horn. Rightly too did she act when she chose the head whereon to set the horns; and AEsop's Momus is beside the mark, when he finds fault with the bull for not having its horns upon its shoulders. For from this position, says he, they would have delivered their blow with the greatest force, whereas on the head they occupy the weakest part of the whole body. Momus was but dull-sighted in making this hostile criticism. For had the horns been set on the shoulders, or had they been set on any other part than they are, the encumbrance of their weight would have been increased, not only without any compensating gain whatso::ver, but with the disadvantage of impeding many bodily operations. For the point whence the blows could be delivered with the greatest force was not the only matter to be considered, but the point also whence they could be delivered with the widest range. But as the bull has no hands and cannot possibly have its horns on its feet or on its knees, where they would prevent flexion, there remains no other site for them but the head; and this therefore they necessarily occupy. In this position, moreover, they are much less in the way of the movements of the body than they would be elsewhere.

Deer are the only animals in which the horns are solid throughout, and are also the only animals that cast them. This casting is not simply advantageous to the deer from the increased lightness which it produces, but, seeing how heavy the horns are, is a matter of actual necessity.

In all other animals the horns are hollow for a certain distance, and the end alone is solid, this being the part of use in a blow. At the same time, to prevent even the hollow part from being weak, the horn, though it grows out of the skin, has a solid piece from the bones fitted into its cavity. For this arrangement is not only that which makes the horns of the greatest service in fighting, but that which causes them to be as little of an impediment as possible in the other actions of life.

Such then are the reasons for which horns exist; and such the reasons why they are present in some animals, absent from others.

Let us now consider the character of the material nature whose necessary results have been made available by rational nature for a final cause.

In the first place, then, the larger the bulk of animals, the greater is the proportion of corporeal and earthy matter which they contain. Thus no very small animal is known to have horns, the smallest horned animal that we are acquainted with being the gazelle. But in all our speculations concerning nature, what we have to consider is the general rule; for that is natural which applies either universally or generally. And thus when we say that the largest animals have most earthy matter, we say so because such is the general rule. Now this earthy matter is used in the animal body to form bone. But in the larger animals there is an excess of it, and this excess is turned by nature to useful account, being converted into weapons of defence. Part of it necessarily flows to the upper portion of the body, and this is

allotted by her in some cases to the formation of tusks and teeth, in others to the formation of horns. Thus it is that no animal that has horns has also front teeth in both jaws, those in the upper jaw being deficient. For nature by subtracting from the teeth adds to the horns; the nutriment which in most animals goes to the former being here spent on the augmentation of the latter. Does, it is true, have no horns and yet are equally deficient with the males as regards the teeth. The reason, however, for this is that they, as much as the males, are naturally horn-bearing animals; but they have been stripped of their horns, because these would not only be useless to them but actually baneful; whereas the greater strength of the males causes these organs, though equally useless, to be less of an impediment. In other animals, where this material is not secreted from the body in the shape of horns, it is used to increase the size of the teeth; in some cases of all the teeth, in others merely of the tusks, which thus become so long as to resemble horns projecting from the jaws.

So much, then, of the parts which appertain to the head.

3

Below the head lies the neck, in such animals as have one. This is the case with those only that have the parts to which a neck is subservient. These parts are the larynx and what is called the oesophagus. Of these the former, or larynx, exists for the sake of respiration, being the instrument by which such animals as breathe inhale and discharge the air. Therefore it is that, when there is no lung, there is also no neck. Of this condition the Fishes are an example. The other part, or oesophagus, is the channel through which food is conveyed to the stomach; so that

all animals that are without a neck are also without a distinct oesophagus; Such a part is in fact not required of necessity for nutritive purposes; for it has no action whatsoever on the food. Indeed there is nothing to prevent the stomach from being placed directly after the mouth. This, however, is quite impossible in the case of the lung. For there must be some sort of tube common to the two divisions of the lung, by which – it being bipartite – the breath may be apportioned to their respective bronchi, and thence pass into the air-pipes; and such an arrangement will be the best for giving perfection to inspiration and expiration. The organ then concerned in respiration must of necessity be of some length; and this, again, necessitates there being an oesophagus to unite mouth and stomach. This oesophagus is of a flesh-like character, and yet admits of extension like a sinew. This latter property is given to it, that it may stretch when food is introduced; while the flesh-like character is intended to make it soft and yielding, and to prevent it from being rasped by particles as they pass downwards, and so suffering damage. On the other hand, the windpipe and the so-called larynx are constructed out of a cartilaginous substance. For they have to serve not only for respiration, but also for vocal purposes; and an instrument that is to produce sounds must necessarily be not only smooth but firm. The windpipe lies in front of the oesophagus, although this position causes it to be some hindrance to the latter in the act of deglutition. For if a morsel of food, fluid or solid, slips into it by accident, choking and much distress and violent fits of coughing ensue. This must be a matter of astonishment to any of those who assert that it is by the windpipe that an animal imbibes fluid. For the consequences just mentioned occur invariably, whenever a particle of food slips in, and are quite obvious. Indeed on many grounds it is ridiculous to say that this is the channel through which animals imbibe fluid. For there is no passage leading from the lung to the stomach, such as the

oesophagus which we see leading thither from the mouth. Moreover, when any cause produces sickness and vomiting, it is plain enough when the fluid is discharged. It is manifest also that fluid, when swallowed, does not pass directly into the bladder and collect there, but goes first into the stomach. For, when red wine is taken, the dejections of the stomach are seen to be coloured by its dregs; and such discoloration has been even seen on many occasions inside the stomach itself, in cases where there have been wounds opening into that organ. However, it is perhaps silly to be minutely particular in dealing with silly statements such as this.

The windpipe then, owing to its position in front of the oesophagus, is exposed, as we have said, to annoyance from the food. To obviate this, however, nature has contrived the epiglottis. This part is not found in all sanguineous animals, but only in such of them as have a lung; nor in all of these, but only in such as at the same time have their skin covered with hairs, and not either with scaly plates or with feathers. In such scaly and feathered animals there is no epiglottis, but its office is supplied by the larynx, which closes and opens, just as in the other case the epiglottis falls down and rises up; rising up during the ingress or egress of breath, and falling down during the ingestion of food, so as to prevent any particle from slipping into the windpipe. Should there be the slightest want of accuracy in this movement, or should an inspiration be made during the ingestion of food, choking and coughing ensue, as already has been noticed. So admirably contrived, however, is the movement both of the epiglottis and of the tongue, that, while the food is being ground to a pulp in the mouth, the tongue very rarely gets caught between the teeth; and, while the food is passing over the epiglottis seldom does a particle of it slip into the windpipe.

The animals which have been mentioned as having no epiglottis owe this deficiency to the dryness of their flesh and to the hardness of their skin. For an epiglottis made of such materials would not admit of easy motion. It would, indeed, take a longer time to shut down an epiglottis made of the peculiar flesh of these animals, and shaped like that of those with hairy skins, than to bring the edges of the windpipe itself into contact with each other.

Thus much then as to the reason why some animals have an epiglottis while others have none, and thus much also as to its use. It is a contrivance of nature to remedy the vicious position of the windpipe in front of the oesophagus. That position is the result of necessity. For it is in the front and centre of the body that the heart is situated, in which we say is the principle of life and the source of all motion and sensation. (For sensation and motion are exercised in the direction which we term forwards, and it is on this very relation that the distinction of before and behind is founded.) But where the heart is, there and surrounding it is the lung. Now inspiration, which occurs for the sake of the lung and for the sake of the principle which has its seat in the heart, is effected through the windpipe. Since then the heart must of necessity lie in the very front place of all, it follows that the larynx also and the windpipe must of necessity lie in front of the oesophagus. For they lead to the lung and heart, whereas the oesophagus leads to the stomach. And it is a universal law that, as regards above and below, front and back, right and left, the nobler and more honourable part invariably is placed uppermost, in front, and on the right, rather than in the opposite positions, unless some more important object stands in the way.

4

We have now dealt with the neck, the oesophagus, and the windpipe, and have next to treat of the viscera. These are peculiar to sanguineous animals, some of which have all of them, others only a part, while no bloodless animals have any at all. Democritus then seems to have been mistaken in the notion he formed of the viscera, if, that is to say, he fancied that the reason why none were discoverable in bloodless animals was that these animals were too small to allow them to be seen. For, in sanguineous animals, both heart and liver are visible enough when the body is only just formed, and while it is still extremely small. For these parts are to be seen in the egg sometimes as early as the third day, being then no bigger than a point; and are visible also in aborted embryos, while still excessively minute. Moreover, as the external organs are not precisely alike in all animals, but each creature is provided with such as are suited to its special mode of life and motion, so is it with the internal parts, these also differing in different animals. Viscera, then, are peculiar to sanguineous animals; and therefore are each and all formed from sanguineous material, as is plainly to be seen in the new-born young of these animals. For in such the viscera are more sanguineous, and of greater bulk in proportion to the body, than at any later period of life, it being in the earliest stage of formation that the nature of the material and its abundance are most conspicuous. There is a heart, then, in all sanguineous animals, and the reason for this has already been given. For that sanguineous animals must necessarily have blood is self-evident. And, as the blood is fluid, it is also a matter of necessity that there shall be a receptacle for it; and it is apparently to meet this requirement that nature has devised the blood-vessels. These, again, must necessarily have one primary source. For it is preferable that there shall be one such, when possible, rather than several. This primary source of the vessels is the heart. For the vessels manifestly

issue from it and do not go through it. Moreover, being as it is homogeneous, it has the character of a blood-vessel. Again its position is that of a primary or dominating part. For nature, when no other more important purpose stands in her way, places the more honourable part in the more honourable position; and the heart lies about the centre of the body, but rather in its upper than its lower half, and also more in front than behind. This is most evident in the case of man, but even in other animals there is a tendency in the heart to assume a similar position, in the centre of the necessary part of the body, that is to say of the part which terminates in the vent for excrement. For the limbs vary in position in different animals, and are not to be counted with the parts which are necessary for life. For life can be maintained even when they are removed; while it is self-evident that the addition of them to an animal is not destructive of it.

There are some who say that the vessels commence in the head. In this they are clearly mistaken. For in the first place, according to their representation, there would be many sources for the vessels, and these scattered; and secondly, these sources would be in a region that is manifestly cold, as is shown by its intolerance of chill, whereas the region of the heart is as manifestly hot. Again, as already said, the vessels continue their course through the other viscera, but no vessel spreads through the heart. From this it is quite evident that the heart is a part of the vessels and their origin; and for this it is well suited by its structure. For its central part consists of a dense and hollow substance, and is moreover full of blood, as though the vessels took thence their origin. It is hollow to serve for the reception of the blood, while its wall is dense, that it may serve to protect the source of heat. For here, and here alone in all the viscera and indeed in all the body, there is blood without blood-vessels, the blood elsewhere being always contained within vessels. Nor is this but consistent with reason. For the blood is conveyed into

the vessels from the heart, but none passes into the heart from without. For in itself it constitutes the origin and fountain, or primary receptacle, of the blood. It is however, from dissections and from observations on the process of development that the truth of these statements receives its clearest demonstration. For the heart is the first of all the parts to be formed; and no sooner is it formed than it contains blood. Moreover, the motions of pain and pleasure, and generally of all sensation, plainly have their source in the heart, and find in it their ultimate termination. This, indeed, reason would lead us to expect. For the source must, when. ever possible, be one; and, of all places, the best suited for a source is the centre. For the centre is one, and is equally or almost equally within reach of every part. Again, as neither the blood itself, nor yet any part which is bloodless, is endowed with sensation, it is plain that that part which first has blood, and which holds it as it were in a receptacle, must be the primary source of sensation. And that this part is the heart is not only a rational inference, but also evident to the senses. For no sooner is the embryo formed, than its heart is seen in motion as though it were a living creature, and this before any of the other parts, it being, as thus shown, the starting-point of their nature in all animals that have blood. A further evidence of the truth of what has been stated is the fact that no sanguineous animal is without a heart. For the primary source of blood must of necessity be present in them all. It is true that sanguineous animals not only have a heart but also invariably have a liver. But no one could ever deem the liver to be the primary organ either of the whole body or of the blood. For the position in which it is placed is far from being that of a primary or dominating part; and, moreover, in the most perfectly finished animals there is another part, the spleen, which as it were counterbalances it. Still further, the liver contains no spacious receptacle in its substance, as does the heart; but its blood is in a vessel as in all the other viscera. The

vessel, moreover, extends through it, and no vessel whatsoever originates in it; for it is from the heart that all the vessels take their rise. Since then one or other of these two parts must be the central source, and since it is not the liver which is such, it follows of necessity that it is the heart which is the source of the blood, as also the primary organ in other respects. For the definitive characteristic of an animal is the possession of sensation; and the first sensory part is that which first has blood; that is to say is the heart, which is the source of blood and the first of the parts to contain it.

The apex of the heart is pointed and more solid than the rest of the organ. It lies against the breast, and entirely in the anterior part of the body, in order to prevent that region from getting chilled. For in all animals there is comparatively little flesh over the breast, whereas there is a more abundant covering of that substance on the posterior surface, so that the heat has in the back a sufficient amount of protection. In all animals but man the heart is placed in the centre of the pectoral region; but in man it inclines a little towards the left, so that it may counterbalance the chilliness of that side. For the left side is colder in man, as compared with the right, than in any other animal. It has been stated in an earlier treatise that even in fishes the heart holds the same position as in other animals; and the reason has been given why it appears not to do so. The apex of the heart, it is true, is in them turned towards the head, but this in fishes is the front aspect, for it is the direction in which their motion occurs.

The heart again is abundantly supplied with sinews, as might reasonably be expected. For the motions of the body commence from the heart, and are brought about by traction and relaxation. The heart therefore, which, as already said,' as it were a living creature inside its possessor, requires some such subservient and strengthening parts.

In no animals does the heart contain a bone, certainly in none of those that we have ourselves inspected, with the exception of the horse and a certain kind of ox. In these exceptional cases the heart, owing to its large bulk, is provided with a bone as a support; just as the bones serve as supports for the body generally.

In animals of great size the heart has three cavities; in smaller animals it has two; and in all has at least one, for, as already stated, there must be some place in the heart to serve as a receptacle for the first blood; which, as has been mentioned more than once, is formed in this organ. But inasmuch as the main blood-vessels are two in number, namely the so-called great vessel and the aorta, each of which is the origin of other vessels; inasmuch, moreover, as these two vessels present differences, hereafter to be discussed, when compared with each other, it is of advantage that they also shall themselves have distinct origins. This advantage will be obtained if each side have its own blood, and the blood of one side be kept separate from that of the other. For this reason the heart, whenever it is possible, has two receptacles. And this possibility exists in the case of large animals, for in them the heart, as the body generally, is of large size. Again it is still better that there shall be three cavities, so that the middle and odd one may serve as a centre common to both sides. But this requires the heart to be of greater magnitude, so that it is only in the largest hearts that there are three cavities.

Of these three cavities it is the right that has the most abundant and the hottest blood, and this explains why the limbs also on the right side of the body are warmer than those on the left. The left cavity has the least blood of all, and the coldest; while in the middle cavity the blood, as regards quantity and heat, is intermediate to the other two, being however of purer quality than either. For it behoves the supreme part to be as tranquil as

possible, and this tranquillity can be ensured by the blood being pure, and of moderate amount and warmth.

In the heart of animals there is also a kind of joint-like division, something like the sutures of the skull. This is not, however, attributable to the heart being formed by the union of several parts into a compound whole, but is rather, as already said, the result of a joint-like division. These jointings are most distinct in animals of keen sensibility, and less so in those that are of duller feeling, in swine for instance. Different hearts differ also from each other in their sizes, and in their degrees of firmness; and these differences somehow extend their influence to the temperaments of the animals. For in animals of low sensibility the heart is hard and dense in texture, while it is softer in such as are endowed with keener feeling. So also when the heart is of large size the animal is timorous, while it is more courageous if the organ be smaller and of moderate bulk. For in the former the bodily affection which results from terror already pre-exists; for the bulk of the heart is out of all proportion to the animal's heat, which being small is reduced to insignificance in the large space, and thus the blood is made colder than it would otherwise be.

The heart is of large size in the hare, the deer, the mouse, the hyena, the ass, the leopard, the marten, and in pretty nearly all other animals that either are manifestly timorous, or betray their cowardice by their spitefulness.

What has been said of the heart as a whole is no less true of its cavities and of the blood-vessels; these also if of large size being cold. For just as a fire of equal size gives less heat in a large room than in a small one, so also does the heat in a large cavity or a large blood-vessel, that is in a large receptacle, have less effect than in a small one. Moreover, all hot bodies are cooled by motions external to themselves, and the more spacious the

cavities and vessels are, the greater the amount of spirit they contain, and the more potent its action. Thus it is that no animal that has large cavities in its heart, or large blood-vessels, is ever fat, the vessels being indistinct and the cavities small in all or most fat animals.

The heart again is the only one of the viscera, and indeed the only part of the body, that is unable to tolerate any serious affection. This is but what might reasonably be expected. For, if the primary or dominant part be diseased, there is nothing from which the other parts which depend upon it can derive succour. A proof that the heart is thus unable to tolerate any morbid affection is furnished by the fact that in no sacrificial victim has it ever been seen to be affected with those diseases that are observable in the other viscera. For the kidneys are frequently found to be full of stones, and growths, and small abscesses, as also are the liver, the lung, and more than all the spleen. There are also many other morbid conditions which are seen to occur in these parts, those which are least liable to such being the portion of the lung which is close to the windpipe, and the portion of the liver which lies about the junction with the great blood-vessel. This again admits of a rational explanation. For it is in these parts that the lung and liver are most closely in communion with the heart. On the other hand, when animals die not by sacrifice but from disease, and from affections such as are mentioned above, they are found on dissection to have morbid affections of the heart.

Thus much of the heart, its nature, and the end and cause of its existence in such animals as have it.

5

In due sequence we have next to discuss the blood-vessels, that is to say the great vessel and the aorta. For it is into these two that the blood first passes when it quits the heart; and all the other vessels are but offshoots from them. Now that these vessels exist on account of the blood has already been stated. For every fluid requires a receptacle, and in the case of the blood the vessels are that receptacle. Let us now explain why these vessels are two, and why they spring from one single source, and extend throughout the whole body.

The reason, then, why these two vessels coalesce into one centre, and spring from one source, is that the sensory soul is in all animals actually one; and this one-ness of the sensory soul determines a corresponding one-ness of the part in which it primarily abides. In sanguineous animals this one-ness is not only actual but potential, whereas in some bloodless animals it is only actual. Where, however, the sensory soul is lodged, there also and in the selfsame place must necessarily be the source of heat; and, again, where this is there also must be the source of the blood, seeing that it thence derives its warmth and fluidity. Thus, then, in the oneness of the part in which is lodged the prime source of sensation and of heat is involved the one-ness of the source in which the blood originates; and this, again, explains why the blood-vessels have one common starting-point.

The vessels, again, are two, because the body of every sanguineous animal that is capable of locomotion is bilateral; for in all such animals there is a distinguishable before and behind, a right and left, an above and below. Now as the front is more honourable and of higher supremacy than the hinder aspect, so also and in like degree is the great vessel superior to the aorta. For the great vessel is placed in front, while the aorta

is behind; the former again is plainly visible in all sanguineous animals, while the latter is in some indistinct and in some not discernible at all.

Lastly, the reason for the vessels being distributed throughout the entire body is that in them, or in parts analogous to them, is contained the blood, or the fluid which in bloodless animals takes the place of blood, and that the blood or analogous fluid is the material from which the whole body is made. Now as to the manner in which animals are nourished, and as to the source from which they obtain nutriment and as to the way in which they absorb this from the stomach, these are matters which may be more suitably considered and explained in the treatise on Generation. But inasmuch as the parts are, as already said, formed out of the blood, it is but rational that the flow of the blood should extend, as it does, throughout the whole of the body. For since each part is formed of blood, each must have blood about and in its substance.

To give an illustration of this. The water-courses in gardens are so constructed as to distribute water from one single source or fount into numerous channels, which divide and subdivide so as to convey it to all parts; and, again, in house-building stones are thrown down along the whole ground-plan of the foundation walls; because the garden-plants in the one case grow at the expense of the water, and the foundation walls in the other are built out of the stones. Now just after the same fashion has nature laid down channels for the conveyance of the blood throughout the whole body, because this blood is the material out of which the whole fabric is made. This becomes very evident in bodies that have undergone great emaciation. For in such there is nothing to be seen but the blood-vessels; just as when fig-leaves or vine-leaves or the like have dried up, there is nothing left of them but their vessels. The explanation of this is that the blood, or fluid which takes its place, is

potentially body and flesh, or substance analogous to flesh. Now just as in irrigation the largest dykes are permanent, while the smallest are soon filled up with mud and disappear, again to become visible when the deposit of mud ceases; so also do the largest blood-vessels remain permanently open, while the smallest are converted actually into flesh, though potentially they are no whit less vessels than before. This too explains why, so long as the flesh of an animal is in its integrity, blood will flow from any part of it whatsoever that is cut, though no vessel, however small, be visible in it. Yet there can be no blood, unless there be a blood-vessel. The vessels then are there, but are invisible owing to their being clogged up, just as the dykes for irrigation are invisible until they have been cleared of mud.

As the blood-vessels advance, they become gradually smaller and smaller, until at last their tubes are too fine to admit the blood. This fluid can therefore no longer find its way through them, though they still give passage to the humour which we call sweat; and especially so when the body is heated, and the mouths of the small vessels are dilated. Instances, indeed, are not unknown of persons who in consequence of a cachectic state have secreted sweat that resembled blood, their body having become loose and flabby, and their blood watery, owing to the heat in the small vessels having been too scanty for its concoction. For, as was before said, every compound of earth and water – and both nutriment and blood are such – becomes thicker from concoction. The inability of the heat to effect concoction may be due either to its being absolutely small in amount, or to its being small in proportion to the quantity of food, when this has been taken excess. This excess again may be of two kinds, either quantitative or qualitative; for all substances are not equally amenable to concoction.

The widest passages in the body are of all parts the most liable to haemorrhage; so that bleeding occurs not infrequently from

the nostrils, the gums, and the fundament, occasionally also from the mouth. Such haemorrhages are of a passive kind, and not violent as are those from the windpipe.

The great vessel and the aorta, which above lie somewhat apart, lower down exchange positions, and by so doing give compactness to the body. For when they reach the point where the legs diverge, they each split into two, and the great vessel passes from the front to the rear, and the aorta from the rear to the front. By this they contribute to the unity of the whole fabric. For as in plaited work the parts hold more firmly together because of the interweaving, so also by the interchange of position between the blood-vessels are the anterior and posterior parts of the body more closely knit together. A similar exchange of position occurs also in the upper part of the body, between the vessels that have issued from the heart. The details however of the mutual relations of the different vessels must be looked for in the treatises on Anatomy and the Researches concerning Animals.

So much, then, as concerns the heart and the blood-vessels. We must now pass on to the other viscera and apply the same method of inquiry to them.

6

The lung, then, is an organ found in all the animals of a certain class, because they live on land. For there must of necessity be some means or other of tempering the heat of the body; and in sanguineous animals, as they are of an especially hot nature, the cooling agency must be external, whereas in the bloodless kinds the innate spirit is sufficient of itself for the purpose. The external cooling agent must be either air or water. In fishes the

agent is water. Fishes therefore never have a lung, but have gills in its place, as was stated in the treatise on Respiration. But animals that breathe are cooled by air. These therefore are all provided with a lung.

All land animals breathe, and even some water animals, such as the whale, the dolphin, and all the spouting Cetacea. For many animals lie half-way between terrestrial and aquatic; some that are terrestrial and that inspire air being nevertheless of such a bodily constitution that they abide for the most time in the water; and some that are aquatic partaking so largely of the land character, that respiration constitutes for them the man condition of life.

The organ of respiration is the lung. This derives its motion from the heart; but it is its own large size and spongy texture that affords amplitude of space for entrance of the breath. For when the lung rises up the breath streams in, and is again expelled when the lung collapses. It has been said that the lung exists as a provision to meet the jumping of the heart. But this is out of the question. For man is practically the only animal whose heart presents this phenomenon of jumping, inasmuch as he alone is influenced by hope and anticipation of the future. Moreover, in most animals the lung is separated from the heart by a considerable interval and lies above it, so that it can contribute nothing to mitigate any jumping.

The lung differs much in different animals. For in some it is of large size and contains blood; while in others it is smaller and of spongy texture. In the vivipara it is large and rich in blood, because of their natural heat; while in the ovipara it is small and dry but capable of expanding to a vast extent when inflated. Among terrestrial animals, the oviparous quadrupeds, such as lizards, tortoises, and the like, have this kind of lung; and, among inhabitants of the air, the animals known as birds.

For in all these the lung is spongy, and like foam. For it is membranous and collapses from a large bulk to a small one, as does foam when it runs together. In this too lies the explanation of the fact that these animals are little liable to thirst and drink but sparingly, and that they are able to remain for a considerable time under water. For, inasmuch as they have but little heat, the very motion of the lung, airlike and void, suffices by itself to cool them for a considerable period.

These animals, speaking generally, are also distinguished from others by their smaller bulk. For heat promotes growth, and abundance of blood is a sure indication of heat. Heat, again, tends to make the body erect; and thus it is that man is the most erect of animals, and the vivipara more erect than other quadrupeds. For no viviparous animal, be it apodous or be it possessed of feet, is so given to creep into holes as are the ovipara.

The lung, then, exists for respiration; and this is its universal office; but in one order of animals it is bloodless and has the structure described above, to suit the special requirements There is, however, no one term to denote all animals that have a lung; no designation, that is, like the term Bird, applicable to the whole of a certain class. Yet the possession of a lung is a part of their essence, just as much as the presence of certain characters constitutes the essence of a bird.

7

Of the viscera some appear to be single, as the heart and lung; others to be double, as the kidneys; while of a third kind it is doubtful in which class they should be reckoned. For the liver and the spleen would seem to lie half-way between the single

and the double organs. For they may be regarded either as constituting each a single organ, or as a pair of organs resembling each other in character.

In reality, however, all the organs are double. The reason for this is that the body itself is double, consisting of two halves, which are however combined together under one supreme centre. For there is an upper and a lower half, a front and a rear, a right side and a left.

This explains why it is that even the brain and the several organs of sense tend in all animals to consist of two parts; and the same explanation applies to the heart with its cavities. The lung again in Ovipara is divided to such an extent that these animals look as though they had actually two lungs. As to the kidneys, no one can overlook their double character. But when we come to the liver and the spleen, any one might fairly be in doubt. The reason of this is, that, in animals that necessarily have a spleen, this organ is such that it might be taken for a kind of bastard liver; while in those in which a spleen is not an actual necessity but is merely present, as it were, by way of token, in an extremely minute form, the liver plainly consists of two parts; of which the larger tends to lie on the right side and the smaller on the left. Not but what there are some even of the Ovipara in which this condition is comparatively indistinctly marked; while, on the other hand, there are some Vivipara in which the liver is manifestly divided into two parts. Examples of such division are furnished by the hares of certain regions, which have the appearance of having two livers, and by the cartilaginous and some other fishes.

It is the position of the liver on the right side of the body that is the main cause for the formation of the spleen; the existence of which thus becomes to a certain extent a matter of necessity in all animals, though not of very stringent necessity.

The reason, then, why the viscera are bilateral is, as we have said, that there are two sides to the body, a right and a left. For each of these sides aims at similarity with the other, and so likewise do their several viscera; and as the sides, though dual, are knit together into unity, so also do the viscera tend to be bilateral and yet one by unity of constitution.

Those viscera which lie below the diaphragm exist one and all on account of the blood-vessels; serving as a bond, by which these vessels, while floating freely, are yet held in connexion with the body. For the vessels give off branches which run to the body through the outstretched structures, like so many anchorlines thrown out from a ship. The great vessel sends such branches to the liver and the spleen; and these viscera – the liver and spleen on either side with the kidneys behind – attach the great vessel to the body with the firmness of nails. The aorta sends similar branches to each kidney, but none to the liver or spleen.

These viscera, then, contribute in this manner to the compactness of the animal body. The liver and spleen assist, moreover, in the concoction of the food; for both are of a hot character, owing to the blood which they contain. The kidneys, on the other hand, take part in the separation of the excretion which flows into the bladder.

The heart then and the liver are essential constituents of every animal; the liver that it may effect concoction, the heart that it may lodge the central source of heat. For some part or other there must be which, like a hearth, shall hold the kindling fire; and this part must be well protected, seeing that it is, as it were, the citadel of the body.

All sanguineous animals, then, need these two parts; and this explains why these two viscera, and these two alone, are invariably found in them all. In such of them, however, as

breathe, there is also as invariably a third, namely the lung. The spleen, on the other hand, is not invariably present; and, in those animals that have it, is only present of necessity in the same sense as the excretions of the belly and of the bladder are necessary, in the sense, that is, of being an inevitable concomitant. Therefore it is that in some animals the spleen is but scantily developed as regards size. This, for instance, is the case in such feathered animals as have a hot stomach. Such are the pigeon, the hawk, and the kite. It is the case also in oviparous quadrupeds, where the spleen is excessively minute, and in many of the scaly fishes. These same animals are also without a bladder, because the loose texture of their flesh allows the residual fluid to pass through and to be applied to the formation of feathers and scales. For the spleen attracts the residual humours from the stomach, and owing to its bloodlike character is enabled to assist in their concoction. Should, however, this residual fluid be too abundant, or the heat of the spleen be too scanty, the body becomes sickly from over-repletion with nutriment. Often, too, when the spleen is affected by disease, the belly becomes hard owing to the reflux into it of the fluid; just as happens to those who form too much urine, for they also are liable to a similar diversion of the fluids into the belly. But in those animals that have but little superfluous fluid to excrete, such as birds and fishes, the spleen is never large, and in some exists no more than by way of token. So also in the oviparous quadrupeds it is small, compact, and like a kidney. For their lung is spongy, and they drink but little, and such superfluous fluid as they have is applied to the growth of the body and the formation of scaly plates, just as in birds it is applied to the formation of feathers.

On the other hand, in such animals as have a bladder, and whose lung contains blood, the spleen is watery, both for the reason already mentioned, and also because the left side of the body is more watery and colder than the right. For each of two

contraries has been so placed as to go together with that which is akin to it in another pair of contraries. Thus right and left, hot and cold, are pairs of contraries; and right is conjoined with hot, after the manner described, and left with cold.

The kidneys when they are present exist not of actual necessity, but as matters of greater finish and perfection. For by their special character they are suited to serve in the excretion of the fluid which collects in the bladder. In animals therefore where this fluid is very abundantly formed, their presence enables the bladder to perform its proper office with greater perfection.

Since then both kidneys and bladder exist in animals for one and the same function, we must next treat of the bladder, though in so doing we disregard the due order of succession in which the parts should be enumerated. For not a word has yet been said of the midriff, which is one of the parts that environ the viscera and therefore has to be considered with them.

8

It is not every animal that has a bladder; those only being apparently intended by nature to have one, whose lung contains blood. To such it was but reasonable that she should give this part. For the superabundance in their lung of its natural constituents causes them to be the thirstiest of animals, and makes them require a more than ordinary quantity not merely of solid but also of liquid nutriment. This increased consumption necessarily entails the production of an increased amount of residue; which thus becomes too abundant to be concocted by the stomach and excreted with its own residual matter. The residual fluid must therefore of necessity have a receptacle of its own; and thus it comes to pass that all animals

whose lung contains blood are provided with a bladder. Those animals, on the other hand, that are without a lung of this character, and that either drink but sparingly owing to their lung being of a spongy texture, or never imbibe fluid at all for drinking's sake but only as nutriment, insects for instance and fishes, and that are moreover clad with feathers or scales or scaly plates – all these animals, owing to the small amount of fluid which they imbibe, and owing also to such residue as there may be being converted into feathers and the like, are invariably without a bladder. The Tortoises, which are comprised among animals with scaly plates, form the only exception; and this is merely due to the imperfect development of their natural conformation; the explanation of the matter being that in the sea-tortoises the lung is flesh-like and contains blood, resembling the lung of the ox, and that in the land-tortoises it is of disproportionately large size. Moreover, inasmuch as the covering which invests them is dense and shell-like, so that the moisture cannot exhale through the porous flesh, as it does in birds and in snakes and other animals with scaly plates, such an amount of secretion is formed that some special part is required to receive and hold it. This then is the reason why these animals, alone of their kind, have a bladder, the sea-tortoise a large one, the land-tortoises an extremely small one.

9

What has been said of the bladder is equally true of the kidneys. For these also are wanting in all animals that are clad with feathers or with scales or with scale-like plates; the sea and land tortoises forming the only exception. In some of the birds, however, there are flattened kidney like bodies, as though the

flesh allotted to the formation of the kidneys, unable to find one single place of sufficient size, had been scattered over several.

The Emys has neither bladder nor kidneys. For the softness of its shell allows of the ready transpiration of fluid; and for this reason neither of the organs mentioned exists in this animal. All other animals, however, whose lung contains blood are, as before said, provided with kidneys. For nature uses these organs for two separate purposes, namely for the excretion of the residual fluid, and to subserve the blood-vessels, a channel leading to them from the great vessel.

In the centre of the kidney is a cavity of variable size. This is the case in all animals, excepting the seal. The kidneys of this animal are more solid than those of any other, and in form resemble the kidneys of the ox. The human kidneys are of similar shape; being as it were made up of numerous small kidneys, and not presenting one unbroken surface like the kidneys of sheep and other quadrupeds. For this reason, should the kidneys of a man be once attacked by disease, the malady is not easily expelled. For it is as though many kidneys were diseased and not merely one; which naturally enhances the difficulties of a cure.

The duct which runs to the kidney from the great vessel does not terminate in the central cavity, but is expended on the substance of the organ, so that there is no blood in the cavity, nor is any coagulum found there after death. A pair of stout ducts, void of blood, run, one from the cavity of each kidney, to the bladder; and other ducts, strong and continuous, lead into the kidneys from the aorta. The purpose of this arrangement is to allow the superfluous fluid to pass from the blood-vessel into the kidney, and the resulting renal excretion to collect by the percolation of the fluid through the solid substance of the organ, in its centre, where as a general rule there is a cavity.

(This by the way explains why the kidney is the most ill-savoured of all the viscera.) From the central cavity the fluid is discharged into the bladder by the ducts that have been mentioned, having already assumed in great degree the character of excremental residue. The bladder is as it were moored to the kidneys; for, as already has been stated, it is attached to them by strong ducts. These then are the purposes for which the kidneys exist, and such the functions of these organs.

In all animals that have kidneys, that on the right is placed higher than that on the left. For inasmuch as motion commences from the right, and the organs on this side are in consequence stronger than those on the left, they must all push upwards in advance of their opposite fellows; as may be seen in the fact that men even raise the right eyebrow more than the left, and that the former is more arched than the latter. The right kidney being thus drawn upwards is in all animals brought into contact with the liver; for the liver lies on the right side.

Of all the viscera the kidneys are those that have the most fat. This is in the first place the result of necessity, because the kidneys are the parts through which the residual matters percolate. For the blood which is left behind after this excretion, being of pure quality, is of easy concoction, and the final result of thorough blood-concoction is lard and suet. For just as a certain amount of fire is left in the ashes of solid substances after combustion, so also does a remnant of the heat that has been developed remain in fluids after concoction; and this is the reason why oily matter is light, and floats on the surface of other fluids. The fat is not formed in the kidneys themselves, the density of their substance forbidding this, but is deposited about their external surface. It consists of lard or of suet, according as the animal's fat is of the former or latter character. The difference between these two kinds of fat has already been

set forth in other passages. The formation, then, of fat in the kidneys is the result of necessity; being, as explained, a consequence of the necessary conditions which accompany the possession of such organs. But at the same time the fat has a final cause, namely to ensure the safety of the kidneys, and to maintain their natural heat. For placed, as these organs are, close to the surface, they require a greater supply of heat than other parts. For while the back is thickly covered with flesh, so as to form a shield for the heart and neighbouring viscera, the loins, in accordance with a rule that applies to all bendings, are destitute of flesh; and fat is therefore formed as a substitute for it, so that the kidneys may not be without protection. The kidneys, moreover, by being fat are the better enabled to secrete and concoct their fluid; for fat is hot, and it is heat that effects concoction.

Such, then, are the reasons why the kidneys are fat. But in all animals the right kidney is less fat than its fellow. The reason for this is, that the parts on the right side are naturally more solid and more suited for motion than those on the left. But motion is antagonistic to fat, for it tends to melt it.

Animals then, as a general rule, derive advantage from their kidneys being fat; and the fat is often very abundant and extends over the whole of these organs. But, should the like occur in the sheep, death ensues. Be its kidneys, however, as fat as they may, they are never so fat but that some part, if not in both at any rate in the right one, is left free. The reason why sheep are the only animals that suffer in this manner, or suffer more than others, is that in animals whose fat is composed of lard this is of fluid consistency, so that there is not the same chance in their case of wind getting shut in and causing mischief. But it is to such an enclosure of wind that rot is due. And thus even in men, though it is beneficial to them to have fat kidneys, yet should these organs become over-fat and

diseased, deadly pains ensue. As to those animals whose fat consists of suet, in none is the suet so dense as in the sheep, neither is it nearly so abundant; for of all animals there is none in which the kidneys become so soon gorged with fat as in the sheep. Rot, then, is produced by the moisture and the wind getting shut up in the kidneys, and is a malady that carries off sheep with great rapidity. For the disease forthwith reaches the heart, passing thither by the aorta and the great vessel, the ducts which connect these with the kidneys being of unbroken continuity.

10

We have now dealt with the heart and the lung, as also with the liver, spleen, and kidneys. The latter are separated from the former by the midriff or, as some call it, the Phrenes. This divides off the heart and lung, and, as already said, is called Phrenes in sanguineous animals, all of which have a midriff, just as they all have a heart and a liver. For they require a midriff to divide the region of the heart from the region of the stomach, so that the centre wherein abides the sensory soul may be undisturbed, and not be overwhelmed, directly food is taken, by its up-steaming vapour and by the abundance of heat then superinduced. For it was to guard against this that nature made a division, constructing the midriff as a kind of partition-wall and fence, and so separated the nobler from the less noble parts, in all cases where a separation of upper from lower is possible. For the upper part is the more honourable, and is that for the sake of which the rest exists; while the lower part exists for the sake of the upper and constitutes the necessary element in the body, inasmuch as it is the recipient of the food.

That portion of the midriff which is near the ribs is fleshier and stronger than the rest, but the central part has more of a membranous character; for this structure conduces best to its strength and its extensibility. Now that the midriff, which is a kind of outgrowth from the sides of the thorax, acts as a screen to prevent heat mounting up from below, is shown by what happens, should it, owing to its proximity to the stomach, attract thence the hot and residual fluid. For when this occurs there ensues forthwith a marked disturbance of intellect and of sensation. It is indeed because of this that the midriff is called Phrenes, as though it had some share in the process of thinking (Phronein). in reality, however, it has no part whatsoever itself in the matter, but, lying in close proximity to organs that have, it brings about the manifest changes of intelligence in question by acting upon them. This too explains why its central part is thin. For though this is in some measure the result of necessity, inasmuch as those portions of the fleshy whole which lie nearest to the ribs must necessarily be fleshier than the rest, yet besides this there is a final cause, namely to give it as small a proportion of humour as possible; for, had it been made of flesh throughout, it would have been more likely to attract and hold a large amount of this. That heating of it affects sensation rapidly and in a notable manner is shown by the phenomena of laughing. For when men are tickled they are quickly set a-laughing, because the motion quickly reaches this part, and heating it though but slightly nevertheless manifestly so disturbs the mental action as to occasion movements that are independent of the will. That man alone is affected by tickling is due firstly to the delicacy of his skin, and secondly to his being the only animal that laughs. For to be tickled is to be set in laughter, the laughter being produced such a motion as mentioned of the region of the armpit.

It is said also that when men in battle are wounded anywhere near the midriff, they are seen to laugh, owing to the heat

produced by the wound. This may possibly be the case. At any rate it is a statement made by much more credible persons than those who tell the story of the human head, how it speaks after it is cut off. For so some assert, and even call in Homer to support them, representing him as alluding to this when he wrote, 'His head still speaking rolled into the dust,' instead of 'The head of the speaker'. So fully was the possibility of such an occurrence accepted in Caria, that one of that country was actually brought to trial under the following circumstances. The priest of Zeus Hoplosmios had been murdered; but as yet it had not been ascertained who was the assassin; when certain persons asserted that they had heard the murdered man's head, which had been severed from the body, repeat several times the words, 'Cercidas slew man on mam.' Search was thereupon made and a man of those parts who bore the name of Cercidas hunted out and put upon his trial. But it is impossible that any one should utter a word when the windpipe is severed and no motion any longer derived from the lung. Moreover, among the Barbarians, where heads are chopped off with great rapidity, nothing of the kind has ever yet occurred. Why, again, does not the like occur in the case of other animals than man? For that none of them should laugh, when their midriff is wounded, is but what one would expect; for no animal but man ever laughs. So, too, there is nothing irrational in supposing that the trunk may run forwards to a certain distance after the head has been cut seeing that bloodless animals at any rate can live, and that for a considerable time, after decapitation, as has been set forth and explained in other passages.

The purposes, then, for which the viscera severally exist have now been stated. It is of necessity upon the inner terminations of the vessels that they are developed; for humour, and that of a bloody character, cannot but exude at these points, and it is of this, solidified and coagulated, that the substance of the viscera

is formed. Thus they are of a bloody character, and in substance resemble each other while they differ from other parts.

11

The viscera are enclosed each in a membrane. For they require some covering to protect them from injury, and require, moreover, that this covering shall be light. To such requirements membrane is well adapted; for it is close in texture so as to form a good protection, destitute of flesh so as neither to attract humour nor retain it, and thin so as to be light and not add to the weight of the body. Of the membranes those are the stoutest and strongest which invest the heart and the brain; as is but consistent with reason. For these are the parts which require most protection, seeing that they are the main governing powers of life, and that it is to governing powers that guard is due.

12

Some animals have all the viscera that have been enumerated; others have only some of them. In what kind of animals this latter is the case, and what is the explanation, has already been stated. Moreover, the self-same viscera present differences in different possessors. For the heart is not precisely alike in all animals that have one; nor, in fact, is any viscus whatsoever. Thus the liver is in some animals split into several parts, while in others it is comparatively undivided. Such differences in its form present themselves even among those sanguineous

animals that are viviparous, but are more marked in fishes and in the oviparous quadrupeds, and this whether we compare them with each other or with the Vivipara. As for birds, their liver very nearly resembles that of the Vivipara; for in them, as in these, it is of a pure and blood-like colour. The reason of this is that the body in both these classes of animals admits of the freest exhalation, so that the amount of foul residual matter within is but small. Hence it is that some of the Vivipara are without any gall-bladder at all. For the liver takes a large share in maintaining the purity of composition and the healthiness of the body. For these are conditions that depend finally and in the main upon the blood, and there is more blood in the liver than in any of the other viscera, the heart only excepted. On the other hand, the liver of oviparous quadrupeds and fishes inclines, as a rule, to a yellow hue, and there are even some of them in which it is entirely of this bad colour, in accordance with the bad composition of their bodies generally. Such, for instance, is the case in the toad, the tortoise, and other similar animals.

The spleen, again, varies in different animals. For in those that have horns and cloven hoofs, such as the goat, the sheep, and the like, it is of a rounded form; excepting when increased size has caused some part of it to extend its growth longitudinally, as has happened in the case of the ox. On the other hand, it is elongated in all polydactylous animals. Such, for instance, is the case in the pig, in man, and in the dog. While in animals with solid hoofs it is of a form intermediate to these two, being broad in one part, narrow in another. Such, for example, is its shape in the horse, the mule, and the ass.

13

The viscera differ from the flesh not only in the turgid aspect of their substance, but also in position; for they lie within the body, whereas the flesh is placed on the outside. The explanation of this is that these parts partake of the character of blood-vessels, and that while the former exist for the sake of the vessels, the latter cannot exist without them.

14

Below the midriff lies the stomach, placed at the end of the oesophagus when there is one, and in immediate contiguity with the mouth when the oesophagus is wanting. Continuous with this stomach is what is called the gut. These parts are present in all animals, for reasons that are self-evident. For it is a matter of necessity that an animal shall receive the incoming food; and necessary also that it shall discharge the same when its goodness is exhausted. This residual matter, again, must not occupy the same place as the yet unconcocted nutriment. For as the ingress of food and the discharge of the residue occur at distinct periods, so also must they necessarily occur in distinct places. Thus there must be one receptacle for the ingoing food and another for the useless residue, and between these, therefore, a part in which the change from one condition to the other may be effected. These, however, are matters which will be more suitably set forth when we come to deal with Generation and Nutrition. What we have at present to consider are the variations presented by the stomach and its subsidiary parts. For neither in size nor in shape are these parts uniformly alike in all animals. Thus the stomach is single in all such sanguineous and viviparous animals as have teeth in front of

both jaws. It is single therefore in all the polydactylous kinds, such as man, dog, lion, and the rest; in all the solid-hoofed animals also, such as horse, mule, ass; and in all those which, like the pig, though their hoof is cloven, yet have front teeth in both jaws. When, however, an animal is of large size, and feeds on substances of so thorny and ligneous a character as to be difficult of concoction, it may in consequence have several stomachs, as for instance is the case with the camel. A similar multiplicity of stomachs exists also in the horned animals; the reason being that horn-bearing animals have no front teeth in the upper jaw. The camel also, though it has no horns, is yet without upper front teeth. The explanation of this is that it is more essential for the camel to have a multiple stomach than to have these teeth. Its stomach, then, is constructed like that of animals without upper front teeth, and, its dental arrangements being such as to match its stomach, the teeth in question are wanting. They would indeed be of no service. Its food, moreover, being of a thorny character, and its tongue necessarily made of a fleshy substance, nature uses the earthy matter which is saved from the teeth to give hardness to the palate. The camel ruminates like the horned animals, because its multiple stomach resembles theirs. For all animals that have horns, the sheep for instance, the ox, the goat, the deer, and the like, have several stomachs. For since the mouth, owing to its lack of teeth, only imperfectly performs its office as regards the food, this multiplicity of stomachs is intended to make up for its shortcomings; the several cavities receiving the food one from the other in succession; the first taking the unreduced substances, the second the same when somewhat reduced, the third when reduction is complete, and the fourth when the whole has become a smooth pulp. Such is the reason why there is this multiplicity of parts and cavities in animals with such dentition. The names given to the several cavities are the paunch, the honeycomb bag, the manyplies, and the reed. How

these parts are related to each other, in position and in shape, must be looked for in the treatises on Anatomy and the Researches concerning Animals.

Birds also present variations in the part which acts as a recipient of the food; and the reason for these variations is the same as in the animals just mentioned. For here again it is because the mouth fails to perform its office and fails even more completely – for birds have no teeth at all, nor any instrument whatsoever with which to comminute or grind down their food – it is, I say, because of this, that in some of them what is called the crop precedes the stomach and does the work of the mouth; while in others the oesophagus is either wide throughout or a part of it bulges just before it enters the stomach, so as to form a preparatory store-house for the unreduced food; or the stomach itself has a protuberance in some part, or is strong and fleshy, so as to be able to store up the food for a considerable period and to concoct it, in spite of its not having been ground into a pulp. For nature retrieves the inefficiency of the mouth by increasing the efficiency and heat of the stomach. Other birds there are, such, namely, as have long legs and live in marshes, that have none of these provisions, but merely an elongated oesophagus. The explanation of this is to be found in the moist character of their food. For all these birds feed on substances easy of reduction, and their food being moist and not requiring much concoction, their digestive cavities are of a corresponding character.

Fishes are provided with teeth, which in almost all of them are of the sharp interfitting kind. For there is but one small section in which it is otherwise. Of these the fish called Scarus (Parrot-fish) is an example. And this is probably the reason why this fish apparently ruminates, though no other fishes do so. For those horned animals that have no front teeth in the upper jaw also ruminate.

In fishes the teeth are all sharp; so that these animals can divide their food, though imperfectly. For it is impossible for a fish to linger or spend time in the act of mastication, and therefore they have no teeth that are flat or suitable for grinding; for such teeth would be to no purpose. The oesophagus again in some fishes is entirely wanting, and in the rest is but short. In order, however, to facilitate the concoction of the food, some of them, as the Cestreus (mullet), have a fleshy stomach resembling that of a bird; while most of them have numerous processes close against the stomach, to serve as a sort of antechamber in which the food may be stored up and undergo putrefaction and concoction. There is contrast between fishes and birds in the position of these processes. For in fishes they are placed close to the stomach; while in birds, if present at all, they are lower down, near the end of the gut. Some of the Vivipara also have processes connected with the lower part of the gut which serve the same purpose as that stated above.

The whole tribe of fishes is of gluttonous appetite, owing to the arrangements for the reduction of their food being very imperfect, and much of it consequently passing through them without undergoing concoction; and, of all, those are the most gluttonous that have a straight intestine. For as the passage of food in such cases is rapid, and the enjoyment derived from it in consequence but brief, it follows of necessity that the return of appetite is also speedy.

It has already been mentioned that in animals with front teeth in both jaws the stomach is of small size. It may be classed pretty nearly always under one or other of two headings, namely as resembling the stomach of the dog, or as resembling the stomach of the pig. In the pig the stomach is larger than in the dog, and presents certain folds of moderate size, the purpose of which is to lengthen out the period of concoction;

while the stomach of the dog is of small size, not much larger in calibre than the gut, and smooth on the internal surface.

Not much larger, I say, than the gut; for in all animals after the stomach comes the gut. This, like the stomach, presents numerous modifications. For in some animals it is uniform, when uncoiled, and alike throughout, while in others it differs in different portions. Thus in some cases it is wider in the neighbourhood of the stomach, and narrower towards the other end; and this explains by the way why dogs have to strain so much in discharging their excrement. But in most animals it is the upper portion that is the narrower and the lower that is of greater width.

Of greater length than in other animals, and much convoluted, are the intestines of those that have horns. These intestines, moreover, as also the stomach, are of ampler volume, in accordance with the larger size of the body. For animals with horns are, as a rule, animals of no small bulk, because of the thorough elaboration which their food undergoes. The gut, except in those animals where it is straight, invariably widens out as we get farther from the stomach and come to what is called the colon, and to a kind of caecal dilatation. After this it again becomes narrower and convoluted. Then succeeds a straight portion which runs right on to the vent. This vent is known as the anus, and is in some animals surrounded by fat, in others not so. All these parts have been so contrived by nature as to harmonize with the various operations that relate to the food and its residue. For, as the residual food gets farther on and lower down, the space to contain it enlarges, allowing it to remain stationary and undergo conversion. Thus is it in those animals which, owing either to their large size, or to the heat of the parts concerned, require more nutriment, and consume more fodder than the rest.

Neither is it without a purpose, that, just as a narrower gut succeeds to the upper stomach, so also does the residual food, when its goodness is thoroughly exhausted, pass from the colon and the ample space of the lower stomach into a narrower channel and into the spiral coil. For so nature can regulate her expenditure and prevent the excremental residue from being discharged all at once.

In all such animals, however, as have to be comparatively moderate in their alimentation, the lower stomach presents no wide and roomy spaces, though their gut is not straight, but has a number of convolutions. For amplitude of space causes desire for ample food, and straightness of the intestine causes quick return of appetite. And thus it is that all animals whose food receptacles are either simple or spacious are of gluttonous habits, the latter eating enormously at a meal, the former making meals at short intervals.

Again, since the food in the upper stomach, having just been swallowed, must of necessity be quite fresh, while that which has reached the lower stomach must have had its juices exhausted and resemble dung, it follows of necessity that there must also be some intermediate part, in which the change may be effected, and where the food will be neither perfectly fresh nor yet dung. And thus it is that, in all such animals as we are now considering, there is found what is called the jejunum; which is a part of the small gut, of the gut, that is, which comes next to the stomach. For this jejunum lies between the upper cavity which contains the yet unconcocted food and the lower cavity which holds the residual matter, which by the time it has got here has become worthless. There is a jejunum in all these animals, but it is only plainly discernible in those of large size, and this only when they have abstained from food for a certain time. For then alone can one hit on the exact period when the food lies half-way between the upper and lower cavities; a

period which is very short, for the time occupied in the transition of food is but brief. In females this jejunum may occupy any part whatsoever of the upper intestine, but in males it comes just before the caecum and the lower stomach.

15

What is known as rennet is found in all animals that have a multiple stomach, and in the hare among animals whose stomach is single. In the former the rennet neither occupies the large paunch, nor the honeycomb bag, nor the terminal reed, but is found in the cavity which separates this terminal one from the two first, namely in the so-called manyplies. It is the thick character of their milk which causes all these animals to have rennet; whereas in animals with a single stomach the milk is thin, and consequently no rennet is formed. It is this difference in thickness which makes the milk of horned animals coagulate, while that of animals without horns does not. Rennet forms in the hare because it feeds on herbage that has juice like that of the fig; for juice of this kind coagulates the milk in the stomach of the sucklings. Why it is in the manyplies that rennet is formed in animals with multiple stomachs has been stated in the Problems.

Book IV

1

The account which has now been given of the viscera, the stomach, and the other several parts holds equally good not only for the oviparous quadrupeds, but also for such apodous animals as the Serpents. These two classes of animals are indeed nearly akin, a serpent resembling a lizard which has been lengthened out and deprived of its feet. Fishes, again, resemble these two groups in all their parts, excepting that, while these, being land animals, have a lung, fishes have no lung, but gills in its place. None of these animals, excepting the tortoise, as also no fish, has a urinary bladder. For owing to the bloodlessness of their lung, they drink but sparingly; and such fluid as they have is diverted to the scaly plates, as in birds it is diverted to the feathers, and thus they come to have the same white matter on the surface of their excrement as we see on that of birds. For in animals that have a bladder, its excretion when voided throws down a deposit of earthy brine in the containing vessel. For the sweet and fresh elements, being light, are expended on the flesh.

Among the Serpents, the same peculiarity attaches to vipers, as among fishes attaches to Selachia. For both these and vipers are externally viviparous, but previously produce ova internally.

The stomach in all these animals is single, just as it is single in all other animals that have teeth in front of both jaws; and their viscera are excessively small, as always happens when there is no bladder. In serpents these viscera are, moreover, differently shaped from those of other animals. For, a serpent's body being

long and narrow, its contents are as it were moulded into a similar form, and thus come to be themselves elongated.

All animals that have blood possess an omentum, a mesentery, intestines with their appendages, and, moreover, a diaphragm and a heart; and all, excepting fishes, a lung and a windpipe. The relative positions, moreover, of the windpipe and the oesophagus are precisely similar in them all; and the reason is the same as has already been given.

2

Almost all sanguineous animals have a gall-bladder. In some this is attached to the liver, in others separated from that organ and attached to the intestines, being apparently in the latter case no less than in the former an appendage of the lower stomach. It is in fishes that this is most clearly seen. For all fishes have a gall-bladder; and in most of them it is attached to the intestine, being in some, as in the Amia, united with this, like a border, along its whole length. It is similarly placed in most serpents There are therefore no good grounds for the view entertained by some writers, that the gall exists for the sake of some sensory action. For they say that its use is to affect that part of the soul which is lodged in the neighbourhood of the liver, vexing this part when it is congealed, and restoring it to cheerfulness when it again flows free. But this cannot be. For in some animals there is absolutely no gall-bladder at all – in the horse, for instance, the mule, the ass, the deer, and the roe; and in others, as the camel, there is no distinct bladder, but merely small vessels of a biliary character. Again, there is no such organ in the seal, nor, of purely sea-animals, in the dolphin. Even within the limits of the same genus, some animals appear to

have and others to be without it. Such, for instance, is the case with mice; such also with man. For in some individuals there is a distinct gall-bladder attached to the liver, while in others there is no gall-bladder at all. This explains how the existence of this part in the whole genus has been a matter of dispute. For each observer, according as he has found it present or absent in the individual cases he has examined, has supposed it to be present or absent in the whole genus. The same has occurred in the case of sheep and of goats. For these animals usually have a gall-bladder; but, while in some localities it is so enormously big as to appear a monstrosity, as is the case in Naxos, in others it is altogether wanting, as is the case in a certain district belonging to the inhabitants of Chalcis in Euboea. Moreover, the gall-bladder in fishes is separated, as already mentioned, by a considerable interval from the liver. No less mistaken seems to be the opinion of Anaxagoras and his followers, that the gall-bladder is the cause of acute diseases, inasmuch as it becomes over-full, and spirts out its excess on to the lung, the blood-vessels, and the ribs. For, almost invariably, those who suffer from these forms of disease are persons who have no gall-bladder at all, as would be quite evident were they to be dissected. Moreover, there is no kind of correspondence between the amount of bile which is present in these diseases and the amount which is exuded. The most probable opinion is that, as the bile when it is present in any other part of the body is a mere residuum or a product of decay, so also when it is present in the region of the liver it is equally excremental and has no further use; just as is the case with the dejections of the stomach and intestines. For though even the residua are occasionally used by nature for some useful purpose, yet we must not in all cases expect to find such a final cause; for granted the existence in the body of this or that constituent, with such and such properties, many results must ensue merely as necessary consequences of these properties. All animals,

then, whose is healthy in composition and supplied with none but sweet blood, are either entirely without a gall-bladder on this organ, or have merely small bile-containing vessels; or are some with and some without such parts. Thus it is that the liver in animals that have no gall-bladder is, as a rule, of good colour and sweet; and that, when there is a gall-bladder, that part of the liver is sweetest which lies immediately underneath it. But, when animals are formed of blood less pure in composition, the bile serves for the excretion of its impure residue. For the very meaning of excrement is that it is the opposite of nutriment, and of bitter that it is the opposite of sweet; and healthy blood is sweet. So that it is evident that the bile, which is bitter, cannot have any use, but must simply be a purifying excretion. It was therefore no bad saying of old writers that the absence of a gall-bladder gave long life. In so saying they had in mind deer and animals with solid hoofs. For such have no gall-bladder and live long. But besides these there are other animals that have no gall-bladder, though those old writers had not noticed the fact, such as the camel and the dolphin; and these also are, as it happens, long-lived. Seeing, indeed, that the liver is not only useful, but a necessary and vital part in all animals that have blood, it is but reasonable that on its character should depend the length or the shortness of life. Nor less reasonable is it that this organ and none other should have such an excretion as the bile. For the heart, unable as it is to stand any violent affection, would be utterly intolerant of the proximity of such a fluid; and, as to the rest of the viscera, none excepting the liver are necessary parts of an animal. It is the liver therefore that alone has this provision. In conclusion, wherever we see bile we must take it to be excremental. For to suppose that it has one character in this part, another in that, would be as great an absurdity as to suppose mucus or the dejections of the stomach to vary in character according to locality and not to be excremental wherever found.

3

So much then of the gall-bladder, and of the reasons why some animals have one, while others have not. We have still to speak of the mesentery and the omentum; for these are associated with the parts already described and contained in the same cavity. The omentum, then, is a membrane containing fat; the fat being suet or lard, according as the fat of the animal generally is of the former or latter description. What kinds of animals are so distinguished has been already set forth in an earlier part of this treatise. This membrane, alike in animals that have a single and in those that have a multiple stomach, grows from the middle of that organ, along a line which is marked on it like a seam. Thus attached, it covers the rest of the stomach and the greater part of the bowels, and this alike in all sanguineous animals, whether they live on land or in water. Now the development of this part into such a form as has been described is the result of necessity. For, whenever solid and fluid are mixed together and heated, the surface invariably becomes membranous and skin-like. But the region in which the omentum lies is full of nutriment of such a mixed character. Moreover, in consequence of the close texture of the membrane, that portion of the sanguineous nutriment will alone filter into it which is of a greasy character; for this portion is composed of the finest particles; and when it has so filtered in, it will be concocted by the heat of the part, and will be converted into suet or lard, and will not acquire a flesh-like or sanguineous constitution. The development, then, of the omentum is simply the result of necessity. But when once formed, it is used by nature for an end, namely, to facilitate and to hasten the concoction of food. For all that is hot aids concoction; and fat is

hot, and the omentum is fat. This too explains why it hangs from the middle of the stomach; for the upper part of the stomach has no need of it, being assisted in concoction by the adjacent liver. Thus much as concerns the omentum.

4

The so-called mesentery is also a membrane; and extends continuously from the long stretch of intestine to the great vessel and the aorta. In it are numerous and close-packed vessels, which run from the intestines to the great vessel and to the aorta. The formation of this membrane we shall find to be the result of necessity, as is that of the other [similar] parts. What, however, is the final cause of its existence in sanguineous animals is manifest on reflection. For it is necessary that animals shall get nutriment from without; and, again, that this shall be converted into the ultimate nutriment, which is then distributed as sustenance to the various parts; this ultimate nutriment being, in sanguineous animals, what we call blood, and having, in bloodless animals, no definite name. This being so, there must be channels through which the nutriment shall pass, as it were through roots, from the stomach into the blood-vessels. Now the roots of plants are in the ground; for thence their nutriment is derived. But in animals the stomach and intestines represent the ground from which the nutriment is to be taken. The mesentery, then, is an organ to contain the roots; and these roots are the vessels that traverse it. This then is the final cause of its existence. But how it absorbs nutriment, and how that portion of the food which enters into the vessels is distributed by them to the various parts of the body, are questions which will be considered when we come to deal with the generation and nutrition of animals.

The constitution of sanguineous animals, so far as the parts as yet mentioned are concerned, and the reasons for such constitution, have now been set forth. In natural sequence we should next go on to the organs of generation, as yet undescribed, on which depend the distinctions of male and female. But, inasmuch as we shall have to deal specially with generation hereafter, it will be more convenient to defer the consideration of these parts to that occasion.

5

Very different from the animals we have as yet considered are the Cephalopoda and the Crustacea. For these have absolutely no viscera whatsoever; as is indeed the case with all bloodless animals, in which are included two other genera, namely the Testacea and the Insects. For in none of them does the material out of which viscera are formed exist. None of them, that is, have blood. The cause of this lies in their essential constitution. For the presence of blood in some animals, its absence from others, must be included in the conception which determines their respective essences. Moreover, in the animals we are now considering, none of those final causes will be found to exist which in sanguineous animals determine the presence of viscera. For they have no blood vessels nor urinary bladder, nor do they breathe; the only part that it is necessary for them to have being that which is analogous to a heart. For in all animals there must be some central and commanding part of the body, to lodge the sensory portion of the soul and the source of life. The organs of nutrition are also of necessity present in them all. They differ, however, in character because of differences of the habitats in which they get their subsistence.

In the Cephalopoda there are two teeth, enclosing what is called the mouth; and inside this mouth is a flesh-like substance which represents a tongue and serves for the discrimination of pleasant and unpleasant food. The Crustacea have teeth corresponding to those of the Cephalopoda, namely their anterior teeth, and also have the fleshy representative of a tongue. This latter part is found, moreover, in all Testacea, and serves, as in sanguineous animals, for gustatory sensations. Similarly provided also are the Insects. For some of these, such as the Bees and the Flies, have, as already described, their proboscis protruding from the mouth; while those others that have no such instrument in front have a part which acts as a tongue inside the mouth. Such, for instance, is the case in the Ants and the like. As for teeth, some insects have them, the Bees and the Ants for instance, though in a somewhat modified form, while others that live on fluid nutriment are without them. For in many insects the teeth are not meant to deal with the food, but to serve as weapons.

In some Testacea, as was said in the first treatise, the organ which is called the tongue is of considerable strength; and in the Cochli (Sea-snails) there are also two teeth, just as in the Crustacea. The mouth in the Cephalopoda is succeeded by a long gullet. This leads to a crop, like that of a bird, and directly continuous with this is the stomach, from which a gut runs without windings to the vent. The Sepias and the Poulps resemble each other completely, so far as regards the shape and consistency of these parts. But not so the Teuthides (Calamaries). Here, as in the other groups there are the two stomach-like receptacles; but the first of these cavities has less resemblance to a crop, and in neither is the form [or the consistency] the same as in the other kinds, the whole body indeed being made of a softer kind of flesh.

The object of this arrangement of the parts in question is the same in the Cephalopoda as in Birds; for these also are all unable to masticate their food; and therefore it is that a crop precedes their stomach.

For purposes of defence, and to enable them to escape from their foes, the Cephalopoda have what is called their ink. This is contained in a membranous pouch, which is attached to the body and provided with a terminal outlet just at the point where what is termed the funnel gives issue to the residua of the stomach. This funnel is placed on the ventral surface of the animal. All Cephalopoda alike have this characteristic ink, but chief of all the Sepia, where it is more abundant than in the rest. When the animal is disturbed and frightened it uses this ink to make the surrounding water black and turbid, and so, as it were, puts a shield in front of its body.

In the Calamaries and the Poulps the ink-bag is placed in the upper part of the body, in close proximity to the mytis, whereas in the Sepia it is lower down, against the stomach. For the Sepia has a more plentiful supply of ink than the rest, inasmuch as it makes more use of it. The reasons for this are, firstly, that it lives near the shore, and, secondly, that it has no other means of protection; whereas the Poulp has its long twining feet to use in its defence, and is, moreover, endowed with the power of changing colour. This changing of colour, like the discharge of ink, occurs as the result of fright. As to the Calamary, it lives far out at sea, being the only one of the Cephalopoda that does so; and this gives it protection. These then are the reasons why the ink is more abundant in the Sepia than in the Calamary, and this greater abundance explains the lower position; for it allows the ink to be ejected with ease even from a distance. The ink itself is of an earthy character, in this resembling the white deposit on the surface of a bird's excrement and the explanation in both cases is the same, namely, the absence of a

urinary bladder. For, in default of this, it is the ink that serves for the excretion of the earthiest matter. And this is more especially the case in the Sepia, because there is a greater proportion of earth in its composition than in that of the other Cephalopoda. The earthy character of its bone is a clear indication of this. For in the Poulp there is no bone at all, and in the Calamary it is thin and cartilaginous. Why this bone should be present in some Cephalopoda, and wanting in others, and how its character varies in those that have it, has now been set forth.

These animals, having no blood, are in consequence cold and of a timid character. Now, in some animals, fear causes a disturbance of the bowels, and, in others, a flow of urine from the bladder. Similarly in these it produces a discharge of ink, and, though the ejection of this ink in fright, like that of the urine, is the result of necessity, and, though it is of excremental character, yet it is used by nature for a purpose, namely, the protection and safety of the animal that excretes it.

The Crustacea also, both the Caraboid forms and the Crabs, are provided with teeth, namely their two anterior teeth; and between these they also present the tongue-like piece of flesh, as has indeed been already mentioned. Directly after their mouth comes a gullet, which, if we compare relative sizes, is but small in proportion to the body: and then a stomach, which in the Carabi and some of the Crabs is furnished with a second set of teeth, the anterior teeth being insufficient for adequate mastication. From the stomach a uniform gut runs in a direct line to the excremental vent.

The parts described are to be found also in all the various Testacea. The degree of distinctness, however, with which they are formed varies in the different kinds, and the larger the size of the animal the more easily distinguishable are all these parts

severally. In the Sea-snails, for example, we find teeth, hard and sharp, as before mentioned, and between them the flesh-like substance, just as in the Crustacea and Cephalopoda, and again the proboscis, which, as has been stated, is something between a sting and a tongue. Directly after the mouth comes a kind of bird-like crop, then a gullet, succeeded by a stomach, in which is the mecon, as it is styled; and continuous with this mecon is an intestine, starting directly from it. It is this residual substance which appears in all the Testacea to form the most palatable morsel. Purpuras and Whelks, and all other Testacea that have turbinate shells, in structure resemble the Sea-snail. The genera and species of Testacea are very numerous. For there are those with turbinate shells, of which some have just been mentioned; and, besides these, there are bivalves and univalves. Those with turbinate shells may, indeed, after a certain fashion be said to resemble bivalves. For they all from their very birth have an operculum to protect that part of their body which is exposed to view. This is the case with the Purpuras, with Whelks, with the Nerites, and the like. Were it not for this, the part which is undefended by the shell would be very liable to injury by collision with external objects. The univalves also are not without protection. For on their dorsal surface they have a shell, and by the under surface they attach themselves to the rocks, and so after a manner become bivalved, the rock representing the second valve. Of these the animals known as Limpets are an example. The bivalves, scallops and mussels, for instance, are protected by the power they have of closing their valves; and the Turbinata by the operculum just mentioned, which transforms them, as it were, crom univalves into bivalves. But of all there is none so perfectly protected as the sea-urchin. For here there is a globular shell which encloses the body completely, and which is, moreover, set with sharp spines. This peculiarity distinguishes the sea-urchin from all other Testacea, as has already been mentioned.

The structure of the Testacea and of the Crustacea is exactly the reverse of that of the Cephalopoda. For in the latter the fleshy substance is on the outside and the earthy substance within, whereas in the former the soft parts are inside and the hard part without. In the sea-urchin, however, there is no fleshy part whatsoever.

All the Testacea then, those that have not been mentioned as well as those that have, agree as stated in possessing a mouth with the tongue-like body, a stomach, and a vent for excrement, but they differ from each other in the positions and proportions of these parts. The details, however, of these differences must be looked for in the Researches concerning Animals and the treatises on Anatomy. For while there are some points which can be made clear by verbal description, there are others which are more suited for ocular demonstration.

Peculiar among the Testacea are the sea-urchins and the animals known as Tethya (Ascidians). The sea-urchins have five teeth, and in the centre of these the fleshy body which is common to all the animals we have been discussing. Immediately after this comes a gullet, and then the stomach, divided into a number of separate compartments, which look like so many distinct stomachs; for the cavities are separate and all contain abundant residual matter. They are all, however, connected with one and the same oesophagus, and they all end in one and the same excremental vent. There is nothing besides the stomach of a fleshy character, as has already been stated. All that can be seen are the so-called ova, of which there are several, contained each in a separate membrane, and certain black bodies which have no name, and which, beginning at the animal's mouth, are scattered round its body here and there promiscuously. These sea-urchins are not all of one species, but there are several different kinds, and in all of them the parts mentioned are to be found. It is not, however, in every kind that

the so-called ova are edible. Neither do these attain to any size in any other species than that with which we are all familiar. A similar distinction may be made generally in the case of all Testacea. For there is a great difference in the edible qualities of the flesh of different kinds; and in some, moreover, the residual substance known as the mecon is good for food, while in others it is uneatable. This mecon in the turbinated genera is lodged in the spiral part of the shell, while in univalves, such as limpets, it occupies the fundus, and in bivalves is placed near the hinge, the so-called ovum lying on the right; while on the opposite side is the vent. The former is incorrectly termed ovum, for it merely corresponds to what in well-fed sanguineous animals is fat; and thus it is that it makes its appearance in Testacea at those seasons of the year when they are in good condition, namely, spring and autumn. For no Testacea can abide extremes of temperature, and they are therefore in evil plight in seasons of great cold or heat. This is clearly shown by what occurs in the case of the sea-urchins. For though the ova are to be found in these animals even directly they are born, yet they acquire a greater size than usual at the time of full moon; not, as some think, because sea-urchins eat more at that season, but because the nights are then warmer, owing to the moonlight. For these creatures are bloodless, and so are unable to stand cold and require warmth. Therefore it is that they are found in better condition in summer than at any other season; and this all over the world excepting in the Pyrrhean tidal strait. There the sea-urchins flourish as well in winter as in summer. But the reason for this is that they have a greater abundance of food in the winter, because the fish desert the strait at that season.

The number of the ova is the same in all sea-urchins, and is an odd one. For there are five ova, just as there are also five teeth and five stomachs; and the explanation of this is to be found in the fact that the so-called ova are not really ova, but merely, as was said before, the result of the animal's well-fed condition.

Oysters also have a so-called ovum, corresponding in character to that of the sea-urchins, but existing only on one side of their body. Now inasmuch as the sea-urchin is of a spherical form, and not merely a single disk like the oyster, and in virtue of its spherical shape is the same from whatever side it be examined, its ovum must necessarily be of a corresponding symmetry. For the spherical shape has not the asymmetry of the disk-shaped body of the oysters. For in all these animals the head is central, but in the sea-urchin the so-called ovum is above [and symmetrical, while in the oyster it is only one side]. Now the necessary symmetry would be observed were the ovum to form a continuous ring. But this may not be. For it would be in opposition to what prevails in the whole tribe of Testacea; for in all the ovum is discontinuous, and in all excepting the sea-urchins asymmetrical, being placed only on one side of the body. Owing then to this necessary discontinuity of the ovum, which belongs to the sea-urchin as a member of the class, and owing to the spherical shape of its body, which is its individual peculiarity, this animal cannot possibly have an even number of ova. For were they an even number, they would have to be arranged exactly opposite to each other, in pairs, so as to keep the necessary symmetry; one ovum of each pair being placed at one end, the other ovum at the other end of a transverse diameter. This again would violate the universal provision in Testacea. For both in the oysters and in the scallops we find the ovum only on one side of the circumference. The number then of the ova must be uneven, three for instance, or five. But if there were only three they would be much too far apart; while, if there were more than five, they would come to form a continuous mass. The former arrangement would be disadvantageous to the animal, the latter an impossibility. There can therefore be neither more nor less than five. For the same reason the stomach is divided into five parts, and there is a corresponding number of teeth. For seeing that the ova

represent each of them a kind of body for the animal, their disposition must conform to that of the stomach, seeing that it is from this that they derive the material for their growth. Now if there were only one stomach, either the ova would be too far off from it, or it would be so big as to fill up the whole cavity, and the sea-urchin would have great difficulty in moving about and finding due nourishment for its repletion. As then there are five intervals between the five ova, so are there of necessity five divisions of the stomach, one for each interval. So also, and on like grounds, there are five teeth. For nature is thus enabled to allot to each stomachal compartment and ovum its separate and similar tooth. These, then, are the reasons why the number of ova in the sea-urchin is an odd one, and why that odd number is five. In some sea-urchins the ova are excessively small, in others of considerable size, the explanation being that the latter are of a warmer constitution, and so are able to concoct their food more thoroughly; while in the former concoction is less perfect, so that the stomach is found full of residual matter, while the ova are small and uneatable. Those of a warmer constitution are, moreover, in virtue of their warmth more given to motion, so that they make expeditions in search of food, instead of remaining stationary like the rest. As evidence of this, it will be found that they always have something or other sticking to their spines, as though they moved much about; for they use their spines as feet.

The Ascidians differ but slightly from plants, and yet have more of an animal nature than the sponges, which are virtually plants and nothing more. For nature passes from lifeless objects to animals in such unbroken sequence, interposing between them beings which live and yet are not animals, that scarcely any difference seems to exist between two neighbouring groups owing to their close proximity.

A sponge, then, as already said, in these respects completely resembles a plant, that throughout its life it is attached to a rock, and that when separated from this it dies. Slightly different from the sponges are the so-called Holothurias and the sea-lungs, as also sundry other sea-animals that resemble them. For these are free and unattached. Yet they have no feeling, and their life is simply that of a plant separated from the ground. For even among land-plants there are some that are independent of the soil, and that spring up and grow, either upon other plants, or even entirely free. Such, for example, is the plant which is found on Parnassus, and which some call the Epipetrum. This you may hang up on a peg and it will yet live for a considerable time. Sometimes it is a matter of doubt whether a given organism should be classed with plants or with animals. The Ascidians, for instance, and the like so far resemble plants as that they never live free and unattached, but, on the other hand, inasmuch as they have a certain flesh-like substance, they must be supposed to possess some degree of sensibility.

An Ascidian has a body divided by a single septum and with two orifices, one where it takes in the fluid matter that ministers to its nutrition, the other where it discharges the surplus of unused juice, for it has no visible residual substance, such as have the other Testacea. This is itself a very strong justification for considering an Ascidian, and anything else there may be among animals that resembles it, to be of a vegetable character; for plants also never have any residuum. Across the middle of the body of these Ascidians there runs a thin transverse partition, and here it is that we may reasonably suppose the part on which life depends to be situated.

The Acalephae, or Sea-nettles, as they are variously called, are not Testacea at all, but lie outside the recognized groups. Their constitution, like that of the Ascidians, approximates them on

one side to plants, on the other to animals. For seeing that some of them can detach themselves and can fasten upon their food, and that they are sensible of objects which come in contact with them, they must be considered to have an animal nature. The like conclusion follows from their using the asperity of their bodies as a protection against their enemies. But, on the other hand, they are closely allied to plants, firstly by the imperfection of their structure, secondly by their being able to attach themselves to the rocks, which they do with great rapidity, and lastly by their having no visible residuum notwithstanding that they possess a mouth.

Very similar again to the Acalephae are the Starfishes. For these also fasten on their prey, and suck out its juices, and thus destroy a vast number of oysters. At the same time they present a certain resemblance to such of the animals we have described as the Cephalopoda and Crustacea, inasmuch as they are free and unattached. The same may also be said of the Testacea.

Such, then, is the structure of the parts that minister to nutrition and which every animal must possess. But besides these organs it is quite plain that in every animal there must be some part or other which shall be analogous to what in sanguineous animals is the presiding seat of sensation. Whether an animal has or has not blood, it cannot possibly be without this. In the Cephalopoda this part consists of a fluid substance contained in a membrane, through which runs the gullet on its way to the stomach. It is attached to the body rather towards its dorsal surface, and by some is called the mytis. Just such another organ is found also in the Crustacea and there too is known by the same name. This part is at once fluid and corporeal and, as before said, is traversed by the gullet. For had the gullet been placed between the mytis and the dorsal surface of the animal, the hardness of the back would have interfered with its due dilatation in the act of deglutition. On

the outer surface of the mytis runs the intestine; and in contact with this latter is placed the ink-bag, so that it may be removed as far as possible from the mouth and its obnoxious fluid be kept at a distance from the nobler and sovereign part. The position of the mytis shows that it corresponds to the heart of sanguineous animals; for it occupies the self-same place. The same is shown by the sweetness of its fluid, which has the character of concocted matter and resembles blood.

In the Testacea the presiding seat of sensation is in a corresponding position, but is less easily made out. It should, however, always be looked for in some midway position; namely, in such Testacea as are stationary, midway between the part by which food is taken in and the channel through which either the excrement or the spermatic fluid is voided, and, in those species which are capable of locomotion, invariably midway between the right and left sides.

In Insects this organ, which is the seat of sensation, lies, as was stated in the first treatise, between the head and the cavity which contains the stomach. In most of them it consists of a single part; but in others, for instance in such as have long bodies and resemble the Juli (Millipedes), it is made up of several parts, so that such insects continue to live after they have been cut in pieces. For the aim of nature is to give to each animal only one such dominant part; and when she is unable to carry out this intention she causes the parts, though potentially many, to work together actually as one. This is much more clearly marked in some insects than in others.

The parts concerned in nutrition are not alike in all insects, but show considerable diversity. Thus some have what is called a sting in the mouth, which is a kind of compound instrument that combines in itself the character of a tongue and of lips. In others that have no such instrument in front there is a part

inside the mouth that answers the same sensory purposes. Immediately after the mouth comes the intestine, which is never wanting in any insect. This runs in a straight line and without further complication to the vent; occasionally, however, it has a spiral coil. There are, moreover, some insects in which a stomach succeeds to the mouth, and is itself succeeded by a convoluted intestine, so that the larger and more voracious insects may be enabled to take in a more abundant supply of food. More curious than any are the Cicadae. For here the mouth and the tongue are united so as to form a single part, through which, as through a root, the insect sucks up the fluids on which it lives. Insects are always small eaters, not so much because of their diminutive size as because of their cold temperament. For it is heat which requires sustenance; just as it is heat which speedily concocts it. But cold requires no sustenance. In no insects is this so conspicuous as in these Cicadae. For they find enough to live on in the moisture which is deposited from the air. So also do the Ephemera that are found about the Black sea. But while these latter only live for a single day, the Cicadae subsist on such food for several days, though still not many.

We have now done with the internal parts of animals, and must therefore return to the consideration of the external parts which have not yet been described. It will be better to change our order of exposition and begin with the animals we have just been describing, so that proceeding from these, which require less discussion, our account may have more time to spend on the perfect kinds of animals, those namely that have blood.

6

We will begin with Insects. These animals, though they present no great multiplicity of parts, are not without diversities when compared with each other. They are all manyfooted; the object of this being to compensate their natural slowness and frigidity, and give greater activity to their motions. Accordingly we find that those which, as the (Millipedes), have long bodies, and are therefore the most liable to refrigeration, have also the greatest number of feet. Again, the body in these animals is insected – the reason for this being that they have not got one vital centre but many – and the number of their feet corresponds to that of the insections.

Should the feet fall short of this, their deficiency is compensated by the power of flight. Of such flying insects some live a wandering life, and are forced to make long expeditions in search of food. These have a body of light weight, and four feathers, two on either side, to support it. Such are bees and the insects akin to them. When, however, such insects are of very small bulk, their feathers are reduced to two, as is the case with flies. Insects with heavy bodies and of stationary habits, though not polypterous in the same way as bees, yet have sheaths to their feathers to maintain their efficiency. Such are the Melolonthae and the like. For their stationary habits expose their feathers to much greater risks than are run by those of insects that are more constantly in flight, and on this account they are provided with this protecting shield. The feather of an insect has neither barbs nor shaft. For, though it is called a feather, it is no feather at all, but merely a skin-like membrane that, owing to its dryness, necessarily becomes detached from the surface of the body, as the fleshy substance grows cold.

These animals then have their bodies insected, not only for the reasons already assigned, but also to enable them to curl round

in such a manner as may protect them from injury; for such insects as have long bodies can roll themselves up, which would be impossible were it not for the insections; and those that cannot do this can yet draw their segments up into the insected spaces, and so increase the hardness of their bodies. This can be felt quite plainly by putting the finger on one of the insects, for instance, known as Canthari. The touch frightens the insect, and it remains motionless, while its body becomes hard. The division of the body into segments is also a necessary result of there being several supreme organs in place of one; and this again is a part of the essential constitution of insects, and is a character which approximates them to plants. For as plants, though cut into pieces, can still live, so also can insects. There is, however, this difference between the two cases, that the portions of the divided insect live only for a limited time, whereas the portions of the plant live on and attain the perfect form of the whole, so that from one single plant you may obtain two or more.

Some insects are also provided with another means of protection against their enemies, namely a sting. In some this is in front, connected with the tongue, in others behind at the posterior end. For just as the organ of smell in elephants answers several uses, serving alike as a weapon and for purposes of nutrition, so does also the sting, when placed in connexion with the tongue, as in some insects, answer more than one end. For it is the instrument through which they derive their sensations of food, as well as that with which they suck it up and bring it to the mouth. Such of these insects as have no anterior sting are provided with teeth, which serve in some of them for biting the food, and in others for its prehension and conveyance to the mouth. Such are their uses, for instance, in ants and all the various kinds of bees. As for the insects that have a sting behind, this weapon is given them because they are of a fierce disposition. In some of them the

sting is lodged inside the body, in bees, for example, and wasps. For these insects are made for flight, and were their sting external and of delicate make it would soon get spoiled; and if, on the other hand, it were of thicker build, as in scorpions, its weight would be an incumbrance. As for scorpions that live on the ground and have a tail, their sting must be set upon this, as otherwise it would be of no use as a weapon. Dipterous insects never have a posterior sting. For the very reason of their being dipterous is that they are small and weak, and therefore require no more than two feathers to support their light weight; and the same reason which reduces their feathers to two causes their sting to be in front; for their strength is not sufficient to allow them to strike efficiently with the hinder part of the body. Polypterous insects, on the other hand, are of greater bulk – indeed it is this which causes them to have so many feathers; and their greater size makes them stronger in their hinder parts. The sting of such insects is therefore placed behind. Now it is better, when possible, that one and the same instrument shall not be made to serve several dissimilar uses; but that there shall be one organ to serve as a weapon, which can then be very sharp, and a distinct one to serve as a tongue, which can then be of spongy texture and fit to absorb nutriment. Whenever, therefore, nature is able to provide two separate instruments for two separate uses, without the one hampering the other, she does so, instead of acting like a coppersmith who for cheapness makes a spit and lampholder in one. It is only when this is impossible that she uses one organ for several functions.

The anterior legs are in some cases longer than the others, that they may serve to wipe away any foreign matter that may lodge on the insect's eyes and obstruct its sight, which already is not very distinct owing to the eyes being made of a hard substance. Flies and bees and the like may be constantly seen thus dressing themselves with crossed forelegs. Of the other legs, the

hinder are bigger than the middle pair, both to aid in running and also that the insect, when it takes flight, may spring more easily from the ground. This difference is still more marked in such insects as leap, in locusts for instance, and in the various kinds of fleas. For these first bend and then extend the legs, and, by doing so, are necessarily shot up from the ground. It is only the. hind legs of locusts, and not the front ones, that resemble the steering oars of a ship. For this requires that the joint shall be deflected inwards, and such is never the case with the anterior limbs. The whole number of legs, including those used in leaping, is six in all these insects.

7

In the Testacea the body consists of but few parts, the reason being that these animals live a stationary life. For such animals as move much about must of necessity have more numerous parts than such as remain quiet; for their activities are many, and the more diversified the movements the greater the number of organs required to effect them. Some species of Testacea are absolutely motionless, and others not quite but nearly so. Nature, however, has provided them with a protection in the hardness of the shell with which she has invested their body. This shell, as already has been said, may have one valve, or two valves, or be turbinate. In the latter case it may be either spiral, as in whelks, or merely globular, as in sea-urchins. When it has two valves, these may be gaping, as in scallops and mussels, where the valves are united together on one side only, so as to open and shut on the other; or they may be united together on both sides, as in the Solens (razor-fishes). In all cases alike the Testacea have, like plants, the head downwards. The reason for this is, that they take in their nourishment from

below, just as do plants with their roots. Thus the under parts come in them to be above, and the upper parts to be below. The body is enclosed in a membrane, and through this the animal filters fluid free from salt and absorbs its nutriment. In all there is a head; but none of the parts, excepting this recipient of food, has any distinctive name.

8

All the Crustacea can crawl as well as swim, and accordingly they are provided with numerous feet. There are four main genera, viz. the Carabi, as they are called, the Astaci, the Carides, and the Carcini. In each of these genera, again, there are numerous species, which differ from each other not only as regards shape, but also very considerably as regards size. For, while in some species the individuals are large, in others they are excessively minute. The Carcinoid and Caraboid Crustacea resemble each other in possessing claws. These claws are not for locomotion, but to serve in place of hands for seizing and holding objects; and they are therefore bent in the opposite direction to the feet, being so twisted as to turn their convexity towards the body, while their feet turn towards it their concavity. For in this position the claws are best suited for laying hold of the food and carrying it to the mouth. The distinction between the Carabi and the Carcini (Crabs) consists in the former having a tail while the latter have none. For the Carabi swim about and a tail is therefore of use to them, serving for their propulsion like the blade of an oar. But it would be of no use to the Crabs; for these animals live habitually close to the shore, and creep into holes and corners. In such of them as live out at sea, the feet are much less adapted for locomotion than in the rest, because they are little given to moving about

but depend for protection on their shell-like covering. The Maiae and the crabs known as Heracleotic are examples of this; the legs in the former being very thin, in the latter very short.

The very minute crabs that are found among the small fry at the bottom of the net have their hindermost feet flattened out into the semblance of fins or oar-blades, so as to help the animal in swimming.

The Carides are distinguished from the Carcinoid species by the presence of a tail; and from the Caraboids by the absence of claws. This is explained by their large number of feet, on which has been expended the material for the growth of claws. Their feet again are numerous to suit their mode of progression, which is mainly by swimming.

Of the parts on the ventral surface, those near the head are in some of these animals formed like gills, for the admission and discharge of water; while the parts lower down differ in the two sexes. For in the female Carabi these are more laminar than in the males, and in the female crabs the flap is furnished with hairier appendages. This gives ampler space for the disposal of the ova, which the females retain in these parts instead of letting them go free, as do fishes and all other oviparous animals. In the Carabi and in the Crabs the right claw is invariably the larger and the stronger. For it is natural to every animal in active operations to use the parts on its right side in preference to those on its left; and nature, in distributing the organs, invariably assigns each, either exclusively or in a more perfect condition, to such animals as can use it. So it is with tusks, and teeth, and horns, and spurs, and all such defensive and offensive weapons.

In the Lobsters alone it is a matter of chance which claw is the larger, and this in either sex. Claws they must have, because they belong to a genus in which this is a constant character; but

they have them in this indeterminate way, owing to imperfect formation and to their not using them for their natural purpose, but for locomotion.

For a detailed account of the several parts of these animals, of their position and their differences, those parts being also included which distinguish the sexes, reference must be made to the treatises on Anatomy and to the Researches concerning Animals.

9

We come now to the Cephalopoda. Their internal organs have already been described with those of other animals. Externally there is the trunk of the body, not distinctly defined, and in front of this the head surrounded by feet, which form a circle about the mouth and teeth, and are set between these and the eyes. Now in all other animals the feet, if there are any, are disposed in one of two ways; either before and behind or along the sides, the latter being the plan in such of them, for instance, as are bloodless and have numerous feet. But in the Cephalopoda there is a peculiar arrangement, different from either of these. For their feet are all placed at what may be called the fore end. The reason for this is that the hind part of their body has been drawn up close to the fore part, as is also the case in the turbinated Testacea. For the Testacea, while in some points they resemble the Crustacea, in others resemble the Cephalopoda. Their earthy matter is on the outside, and their fleshy substance within. So far they are like the Crustacea. But the general plan of their body is that of the Cephalopoda; and, though this is true in a certain degree of all the Testacea, it is more especially true of those turbinated species that have a

spiral shell. Of this general plan, common to the two, we will speak presently. But let us first consider the case of quadrupeds and of man, where the arrangement is that of a straight line. Let A at the upper end of such a line be supposed to represent the mouth, then B the gullet, and C the stomach, and the intestine to run from this C to the excremental vent where D is inscribed. Such is the plan in sanguineous animals; and round this straight line as an axis are disposed the head and so-called trunk; the remaining parts, such as the anterior and posterior limbs, having been superadded by nature, merely to minister to these and for locomotion.

In the Crustacea also and in Insects there is a tendency to a similar arrangement of the internal parts in a straight line; the distinction between these groups and the sanguineous animals depending on differences of the external organs which minister to locomotion. But the Cephalopoda and the turbinated Testacea have in common an arrangement which stands in contrast with this. For here the two extremities are brought together by a curve, as if one were to bend the straight line marked E until D came close to Such, then, is the disposition of the internal parts; and round these, in the Cephalopoda, is placed the sac (in the Poulps alone called a head), and, in the Testacea, the turbinate shell which corresponds to the sac. There is, in fact, only this difference between them, that the investing substance of the Cephalopoda is soft while the shell of the Testacea is hard, nature having surrounded their fleshy part with this hard coating as a protection because of their limited power of locomotion. In both classes, owing to this arrangement of the internal organs, the excrement is voided near the mouth; at a point below this orifice in the Cephalopoda, and in the Turbinata on one side of it.

Such, then, is the explanation of the position of the feet in the Cephalopoda, and of the contrast they present to other animals

in this matter. The arrangement, however, in the Sepias and the Calamaries is not precisely the same as in the Poulps, owing to the former having no other mode of progression than by swimming, while the latter not only swim but crawl. For in the former six of the feet are above the teeth and small, the outer one on either side being the biggest; while the remaining two, which make up the total weight, are below the mouth and are the biggest of all, just as the hind limbs in quadrupeds are stronger than the fore limbs. For it is these that have to support the weight, and to take the main part in locomotion. And the outer two of the upper six are bigger than the pair which intervene between them and the uppermost of all, because they have to assist the lowermost pair in their office. In the Poulps, on the other hand, the four central feet are the biggest. Again, though the number of feet is the same in all the Cephalopoda, namely eight, their length varies in different kinds, being short in the Sepias and the Calamaries, but greater in the Poulps. For in these latter the trunk of the body is of small bulk, while in the former it is of considerable size; and so in the one case nature has used the materials subtracted from the body to give length to the feet, while in the other she has acted in precisely the opposite way, and has given to the growth of the body what she has first taken from the feet. The Poulps, then, owing to the length of their feet, can not only swim but crawl, whereas in the other genera the feet are useless for the latter mode of progression, being small while the bulk of the body is considerable. These short feet would not enable their possessors to cling to the rocks and keep themselves from being torn off by the waves when these run high in times of storm; neither would they serve to lay hold of objects at all remote and bring them in; but, to supply these defects, the animal is furnished with two long proboscises, by which it can moor itself and ride at anchor like a ship in rough weather. These same processes serve also to catch prey at a distance and to bring it to the mouth. They are

so used by both the Sepias and the Calamaries. In the Poulps the feet are themselves able to perform these offices, and there are consequently no proboscises. Proboscises and twining tentacles, with acetabula set upon them, act in the same way and have the same structure as those plaited instruments which were used by physicians of old to reduce dislocations of the fingers. Like these they are made by the interlacing of their fibres, and they act by pulling upon pieces of flesh and yielding substances. For the plaited fibres encircle an object in a slackened condition, and when they are put on the stretch they grasp and cling tightly to whatever it may be that is in contact with their inner surface. Since, then, the Cephalopoda have no other instruments with which to convey anything to themselves from without, than either twining tentacles, as in some species, or proboscises as in others, they are provided with these to serve as hands for offence and defence and other necessary uses.

The acetabula are set in double line in all the Cephalopoda excepting in one kind of poulp, where there is but a single row. The length and the slimness which is part of the nature of this kind of poulp explain the exception. For a narrow space cannot possibly admit of more than a single row. This exceptional character, then, belongs to them, not because it is the most advantageous arrangement, but because it is the necessary consequence of their essential specific constitution.

In all these animals there is a fin, encircling the sac. In the Poulps and the Sepias this fin is unbroken and continuous, as is also the case in the larger calamaries known as Teuthi. But in the smaller kind, called Teuthides, the fin is not only broader than in the Sepias and the Poulps, where it is very narrow, but, moreover, does not encircle the entire sac, but only begins in the middle of the side. The use of this fin is to enable the animal to swim, and also to direct its course. It acts, that is, like the

rump-feathers in birds, or the tail-fin in fishes. In none is it so small or so indistinct as in the Poulps. For in these the body is of small bulk and can be steered by the feet sufficiently well without other assistance.

The Insects, the Crustacea, the Testacea, and the Cephalopoda, have now been dealt with in turn; and their parts have been described, whether internal or external.

10

We must now go back to the animals that have blood, and consider such of their parts, already enumerated, as were before passed over. We will take the viviparous animals first, and, we have done with these, will pass on to the oviparous, and treat of them in like manner.

The parts that border on the head, and on what is known as the neck and throat, have already been taken into consideration. All animals that have blood have a head; whereas in some bloodless animals, such as crabs, the part which represents a head is not clearly defined. As to the neck, it is present in all the Vivipara, but only in some of the Ovipara; for while those that have a lung also have a neck, those that do not inhale the outer air have none. The head exists mainly for the sake of the brain. For every animal that has blood must of necessity have a brain; and must, moreover, for reasons already given, have it placed in an opposite region to the heart. But the head has also been chosen by nature as the part in which to set some of the senses; because its blood is mixed in such suitable proportions as to ensure their tranquillity and precision, while at the same time it can supply the brain with such warmth as it requires. There is yet a third constituent superadded to the head, namely the part

which ministers to the ingestion of food. This has been placed here by nature, because such a situation accords best with the general configuration of the body. For the stomach could not possibly be placed above the heart, seeing that this is the sovereign organ; and if placed below, as in fact it is, then the mouth could not possibly be placed there also. For this would have necessitated a great increase in the length of the body; and the stomach, moreover, would have been removed too far from the source of motion and of concoction.

The head, then, exists for the sake of these three parts; while the neck, again, exists for the sake of the windpipe. For it acts as a defence to this and to the oesophagus, encircling them and keeping them from injury. In all other animals this neck is flexible and contains several vertebrae; but in wolves and lions it contains only a single bone. For the object of nature was to give these animals an organ which should be serviceable in the way of strength, rather than one that should be useful for any of the other purposes to which necks are subservient.

Continuous with the head and neck is the trunk with the anterior limbs. In man the forelegs and forefeet are replaced by arms and by what we call hands. For of all animals man alone stands erect, in accordance with his godlike nature and essence. For it is the function of the god-like to think and to be wise; and no easy task were this under the burden of a heavy body, pressing down from above and obstructing by its weight the motions of the intellect and of the general sense. When, moreover, the weight and corporeal substance become excessive, the body must of necessity incline towards the ground. In such cases therefore nature, in order to give support to the body, has replaced the arms and hands by forefeet, and has thus converted the animal into a quadruped. For, as every animal that walks must of necessity have the two hinder feet, such an animal becomes a quadruped, its body inclining

downwards in front from the weight which its soul cannot sustain. For all animals, man alone excepted, are dwarf-like in form. For the dwarf-like is that in which the upper part is large, while that which bears the weight and is used in progression is small. This upper part is what we call the trunk, which reaches from the mouth to the vent. In man it is duly proportionate to the part below, and diminishes much in its comparative size as the man attains to full growth. But in his infancy the contrary obtains, and the upper parts are large, while the lower part is small; so that the infant can only crawl, and is unable to walk; nay, at first cannot even crawl, but remains without motion. For all children are dwarfs in shape, but cease to be so as they become men, from the growth of their lower part; whereas in quadrupeds the reverse occurs, their lower parts being largest in youth, and advance of years bringing increased growth above, that is in the trunk, which extends from the rump to the head. Thus it is that colts are scarcely, if at all, below full-grown horses in height; and that while still young they can touch their heads with the hind legs, though this is no longer possible when they are older. Such, then, is the form of animals that have either a solid or a cloven hoof. But such as are polydactylous and without horns, though they too are of dwarf-like shape, are so in a less degree; and therefore the greater growth of the lower parts as compared with the upper is also small, being proportionate to this smaller deficiency.

Dwarf-like again is the race of birds and fishes; and so in fact, as already has been said, is every animal that has blood. This is the reason why no other animal is so intelligent as man. For even among men themselves if we compare children with adults, or such adults as are of dwarf-like shape with such as are not, we find that, whatever other superiority the former may possess, they are at any rate deficient as compared with the latter in intelligence. The explanation, as already stated, is that their psychical principle is corporeal, and much impeded in its

motions. Let now a further decrease occur in the elevating heat, and a further increase in the earthy matter, and the animals become smaller in bulk, and their feet more numerous, until at a later stage they become apodous, and extended full length on the ground. Then, by further small successions of change, they come to have their principal organ below; and at last their cephalic part becomes motionless and destitute of sensation. Thus the animal becomes a plant, that has its upper parts downwards and its lower parts above. For in plants the roots are the equivalents of mouth and head, while the seed has an opposite significance, for it is produced above it the extremities of the twigs.

The reasons have now been stated why some animals have many feet, some only two, and others none; why, also, some living things are plants and others animals; and, lastly, why man alone of all animals stands erect. Standing thus erect, man has no need of legs in front, and in their stead has been endowed by nature with arms and hands. Now it is the opinion of Anaxagoras that the possession of these hands is the cause of man being of all animals the most intelligent. But it is more rational to suppose that his endowment with hands is the consequence rather than the cause of his superior intelligence. For the hands are instruments or organs, and the invariable plan of nature in distributing the organs is to give each to such animal as can make use of it; nature acting in this matter as any prudent man would do. For it is a better plan to take a person who is already a flute-player and give him a flute, than to take one who possesses a flute and teach him the art of flute-playing. For nature adds that which is less to that which is greater and more important, and not that which is more valuable and greater to that which is less. Seeing then that such is the better course, and seeing also that of what is possible nature invariably brings about the best, we must conclude that man does not owe his superior intelligence to his hands, but his

hands to his superior intelligence. For the most intelligent of animals is the one who would put the most organs to use; and the hand is not to be looked on as one organ but as many; for it is, as it were, an instrument for further instruments. This instrument, therefore, – the hand – of all instruments the most variously serviceable, has been given by nature to man, the animal of all animals the most capable of acquiring the most varied handicrafts.

Much in error, then, are they who say that the construction of man is not only faulty, but inferior to that of all other animals; seeing that he is, as they point out, bare-footed, naked, and without weapon of which to avail himself. For other animals have each but one mode of defence, and this they can never change; so that they must perform all the offices of life and even, so to speak, sleep with sandals on, never laying aside whatever serves as a protection to their bodies, nor changing such single weapon as they may chance to possess. But to man numerous modes of defence are open, and these, moreover, he may change at will; as also he may adopt such weapon as he pleases, and at such times as suit him. For the hand is talon, hoof, and horn, at will. So too it is spear, and sword, and whatsoever other weapon or instrument you please; for all these can it be from its power of grasping and holding them all. In harmony with this varied office is the form which nature has contrived for it. For it is split into several divisions, and these are capable of divergence. Such capacity of divergence does not prevent their again converging so as to form a single compact body, whereas had the hand been an undivided mass, divergence would have been impossible. The divisions also may be used singly or two together and in various combinations. The joints, moreover, of the fingers are well constructed for prehension and for pressure. One of these also, and this not long like the rest but short and thick, is placed laterally. For were it not so placed all prehension would be as impossible, as

were there no hand at all. For the pressure of this digit is applied from below upwards, while the rest act from above downwards; an arrangement which is essential, if the grasp is to be firm and hold like a tight clamp. As for the shortness of this digit, the object is to increase its strength, so that it may be able, though but one, to counterbalance its more numerous opponents. Moreover, were it long it would be of no use. This is the explanation of its being sometimes called the great digit, in spite of its small size; for without it all the rest would be practically useless. The finger which stands at the other end of the row is small, while the central one of all is long, like a centre oar in a ship. This is rightly so; for it is mainly by the central part of the encircling grasp that a tool must be held when put to use.

No less skilfully contrived are the nails. For, while in man these serve simply as coverings to protect the tips of the fingers, in other animals they are also used for active purposes; and their form in each case is suited to their office.

The arms in man and the fore limbs in quadrupeds bend in contrary directions, this difference having reference to the ingestion of food and to the other offices which belong to these parts. For quadrupeds must of necessity bend their anterior limbs inwards that they may serve in locomotion, for they use them as feet. Not but what even among quadrupeds there is at any rate a tendency for such as are polydactylous to use their forefeet not only for locomotion but as hands. And they are in fact so used, as any one may see. For these animals seize hold of objects, and also repel assailants with their anterior limbs; whereas quadrupeds with solid hoofs use their hind legs for this latter purpose. For their fore limbs are not analogous to the arms and hands of man.

It is this hand-like office of the anterior limbs which explains why in some of the polydactylous quadrupeds, such as wolves, lions, dogs, and leopards, there are actually five digits on each forefoot, though there are only four on each hind one. For the fifth digit of the foot corresponds to the fifth digit of the hand, and like it is called the big one. It is true that in the smaller polydactylous quadrupeds the hind feet also have each five toes. But this is because these animals are creepers; and the increased number of nails serves to give them a tighter grip, and so enables them to creep up steep places with greater facility, or even to run head downwards.

In man between the arms, and in other animals between the forelegs, lies what is called the breast. This in man is broad, as one might expect; for as the arms are set laterally on the body, they offer no impediment to such expansion in this part. But in quadrupeds the breast is narrow, owing to the legs having to be extended in a forward direction in progression and locomotion.

Owing to this narrowness the mammae of quadrupeds are never placed on the breast. But in the human body there is ample space in this part; moreover, the heart and neighbouring organs require protection, and for these reasons this part is fleshy and the mammae are placed upon it separately, side by side, being themselves of a fleshy substance in the male and therefore of use in the way just stated; while in the female, nature, in accordance with what we say is her frequent practice, makes them minister to an additional function, employing them as a store-place of nutriment for the offspring. The human mammae are two in number, in accordance with the division of the body into two halves, a right and a left. They are somewhat firmer than they would otherwise be, because the ribs in this region are joined together; while they form two separate masses, because their presence is in no wise burdensome. In other animals than man, it is impossible for the mammae to be

placed on the breast between the forelegs, for they would interfere with locomotion; they are therefore disposed of otherwise, and in a variety of ways. Thus in such animals as produce but few at a birth, whether horned quadrupeds or those with solid hoofs, the mammae are placed in the region of the thighs, and are two in number, while in such as produce litters, or such as are polydactylous, the dugs are either numerous and placed laterally on the belly, as in swine and dogs, or are only two in number, being set, however, in the centre of the abdomen, as is the case in the lion. The explanation of this latter condition is not that the lion produces few at a birth, for sometimes it has more than two cubs at a time, but is to be found in the fact that this animal has no plentiful supply of milk. For, being a flesheater, it gets food at but rare intervals, and such nourishment as it obtains is all expended on the growth of its body.

In the elephant also there are but two mammae, which are placed under the axillae of the fore limbs. The mammae are not more than two, because this animal has only a single young one at a birth; and they are not placed in the region of the thighs, because they never occupy that position in any polydactylous animal such as this. Lastly, they are placed above, close to the axillae, because this is the position of the foremost dugs in all animals whose dugs are numerous, and the dugs so placed give the most milk. Evidence of this is furnished by the sow. For she always presents these foremost dugs to the first-born of her litter. A single young one is of course a first-born, and so such animals as only produce a single young one must have these anterior dugs to present to it; that is they must have the dugs which are under the axillae. This, then, is the reason why the elephant has but two mammae, and why they are so placed. But, in such animals as have litters of young, the dugs are disposed about the belly; the reason being that more dugs are required by those that will have more young to nourish. Now it

is impossible that these dugs should be set transversely in rows of more than two, one, that is, for each side of the body, the right and the left; they must therefore be placed lengthways, and the only place where there is sufficient length for this is the region between the front and hind legs. As to the animals that are not polydactylous but produce few at a birth, or have horns, their dugs are placed in the region of the thighs. The horse, the ass, the camel are examples; all of which bear but a single young one at a time, and of which the two former have solid hoofs, while in the last the hoof is cloven. As still further examples may be mentioned the deer, the ox, the goat, and all other similar animals.

The explanation is that in these animals growth takes place in an upward direction; so that there must be an abundant collection of residual matter and of blood in the lower region, that is to say in the neighbourhood of the orifices for efflux, and here therefore nature has placed the mammae. For the place in which the nutriment is set in motion must also be the place whence nutriment can be derived by them. In man there are mammae in the male as well as in the female; but some of the males of other animals are without them. Such, for instance, is the case with horses, some stallions being destitute of these parts, while others that resemble their dams have them. Thus much then concerning the mammae.

Next after the breast comes the region of the belly, which is left unenclosed by the ribs for a reason which has already been given; namely that there may be no impediment to the swelling which necessarily occurs in the food as it gets heated, nor to the expansion of the womb in pregnancy.

At the extreme end of what is called the trunk are the parts concerned in the evacuation of the solid and also of the fluid residue. In all sanguineous animals with some few exceptions,

and in all Vivipara without any exception at all, the same part which serves for the evacuation of the fluid residue is also made by nature to serve in sexual congress, and this alike in male and female. For the semen is a kind of fluid and residual matter. The proof of this will be given hereafter, but for the present let it taken for granted. (The like holds good of the menstrual fluid in women, and of the part where they emit semen. This also, however, is a matter of which a more accurate account will be given hereafter. For the present let it be simply stated as a fact, that the catamenia of the female like the semen of the male are residual matter. Both of them, moreover, being fluid, it is only natural that the parts which serve for voidance of the urine should give issue to residues which resemble it in character.) Of the internal structure of these parts, and of the differences which exist between the parts concerned with semen and the parts concerned with conception, a clear account is given in the book of Researches concerning Animals and in the treatises on Anatomy. Moreover, I shall have to speak of them again when I come to deal with Generation. As regards, however, the external shape of these parts, it is plain enough that they are adapted to their operations, as indeed of necessity they must be. There are, however, differences in the male organ corresponding to differences in the body generally. For all animals are not of an equally sinewy nature. This organ, again, is the only one that, independently of any morbid change, admits of augmentation and of diminution of bulk. The former condition is of service in copulation, while the other is required for the advantage of the body at large. For, were the organ constantly in the former condition, it would be an incumbrance. The organ therefore has been formed of such constituents as will admit of either state. For it is partly sinewy, partly cartilaginous, and thus is enabled either to contract or to become extended, and is capable of admitting air.

All female quadrupeds void their urine backwards, because the position of the parts which this implies is useful to them in the act of copulation. This is the case with only some few males, such as the lynx, the lion, the camel, and the hare. No quadruped with a solid hoof is retromingent.

The posterior portion of the body and the parts about the legs are peculiar in man as compared with quadrupeds. Nearly all these latter have a tail, and this whether they are viviparous or oviparous. For, even if the tail be of no great size, yet they have a kind of scut, as at any rate a small representative of it. But man is tail-less. He has, however, buttocks, which exist in none of the quadrupeds. His legs also are fleshy (as too are his thighs and feet); while the legs in all other animals that have any, whether viviparous or not, are fleshless, being made of sinew and bone and spinous substance. For all these differences there is, so to say, one common explanation, and this is that of all animals man alone stands erect. It was to facilitate the maintenance of this position that Nature made his upper parts light, taking away some of their corporeal substance, and using it to increase the weight of lithe parts below, so that the buttocks, the thighs, and the calves of the legs were all made fleshy. The character which she thus gave to the buttocks renders them at the same time useful in resting the body. For standing causes no fatigue to quadrupeds, and even the long continuance of this posture produces in them no weariness; for they are supported the whole time by four props, which is much as though they were lying down. But to man it is no task to remain for any length of time on his feet, his body demanding rest in a sitting position. This, then, is the reason why man has buttocks and fleshy legs; and the presence of these fleshy parts explains why he has no tail. For the nutriment which would otherwise go to the tail is used up in the production of these parts, while at the same time the existence of buttocks does away with the necessity of a tail. But in quadrupeds and other animals the reverse obtains. For

they are of dwarf-like form, so that all the pressure of their weight and corporeal substance is on their upper part, and is withdrawn from the parts below. On this account they are without buttocks and have hard legs. In order, however, to cover and protect that part which serves for the evacuation of excrement, nature has given them a tail of some kind or other, subtracting for the purpose some of the nutriment which would otherwise go to the legs. Intermediate in shape between man and quadrupeds is the ape, belonging therefore to neither or to both, and having on this account neither tail nor buttocks; no tail in its character of biped, no buttocks in its character of quadruped. There is great diversity of so-called tails; and this organ like others is sometimes used by nature for by-purposes, being made to serve not only as a covering and protection to the fundament, but also for other uses and advantages of its possessor.

There are differences in the feet of quadrupeds. For in some of these animals there is a solid hoof, and in others a hoof cloven into two, and again in others a foot divided into many parts.

The hoof is solid when the body is large and the earthy matter present in great abundance; in which case the earth, instead of forming teeth and horns, is separated in the character of a nail, and being very abundant forms one continuous nail, that is a hoof, in place of several. This consumption of the earthy matter on the hoof explains why these animals, as a rule, have no huckle-bones; a second reason being that the presence of such a bone in the joint of the hind leg somewhat impedes its free motion. For extension and flexion can be made more rapidly in parts that have but one angle than in parts that have several. But the presence of a huckle-bone, as a connecting bolt, is the introduction as it were of a new limb-segment between the two ordinary ones. Such an addition adds to the weight of the foot, but renders the act of progression more secure. Thus it is that in

such animals as have a hucklebone, it is only in the posterior and not in the anterior limbs that this bone is found. For the anterior limbs, moving as they do in advance of the others, require to be light and capable of ready flexion, whereas firmness and extensibility are what are wanted in the hind limbs. Moreover, a huckle-bone adds weight to the blow of a limb, and so renders it a suitable weapon of defence; and these animals all use their hind legs to protect themselves, kicking out with their heels against anything which annoys them. In the cloven-hoofed quadrupeds the lighter character of the hind legs admits of there being a huckle-bone; and the presence of the huckle-bone prevents them from having a solid hoof, the bony substance remaining in the joint, and therefore being deficient in the foot. As to the polydactylous quadrupeds, none of them have huckle-bones. For if they had they would not be polydactylous, but the divisions of the foot would only extend to that amount of its breadth which was covered by the huckle-bone. Thus it is that most of the animals that have huckle-bones are cloven-hoofed.

Of all animals man has the largest foot in proportion to the size of the body. This is only what might be expected. For seeing that he is the only animal that stands erect, the two feet which are intended to bear all the weight of the body must be both long and broad. Equally intelligible is it that the proportion between the size of the fingers and that of the whole hand should be inverted in the case of the toes and feet. For the function of the hands is to take hold of objects and retain them by pressure; so that the fingers require to be long. For it is by its flexed portion that the hand grasps an object. But the function of the feet is to enable us to stand securely, and for this the undivided part of the foot requires to be of larger size than the toes. However, it is better for the extremity to be divided than to be undivided. For in an undivided foot disease of any one part would extend to the whole organ; whereas, if the foot be divided into separate

digits, there is not an equal liability to such an occurrence. The digits, again, by being short would be less liable to injury. For these reasons the feet in man are many-toed, while the separate digits are of no great length. The toes, finally, are furnished with nails for the same reason as are the fingers, namely because such projecting parts are weak and therefore require special protection.

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We have now done with such sanguineous animals as live on land and bring forth their young alive; and, having dealt with all their main kinds, we may pass on to such sanguineous animals as are oviparous. Of these some have four feet, while others have none. The latter form a single genus, namely the Serpents; and why these are apodous has been already explained in the dissertation on Animal Progression. Irrespective of this absence of feet, serpents resemble the oviparous quadrupeds in their conformation.

In all these animals there is a head with its component parts; its presence being determined by the same causes as obtain in the case of other sanguineous animals; and in all, with the single exception of the river crocodile, there is a tongue inside the mouth. In this one exception there would seem to be no actual tongue, but merely a space left vacant for it. The reason is that a crocodile is in a way a land-animal and a water-animal combined. In its character of land-animal it has a space for a tongue; but in its character of water-animal it is without the tongue itself. For in some fishes, as has already been mentioned, there is no appearance whatsoever of a tongue, unless the mouth be stretched open very widely indeed; while

in others it is indistinctly separated from the rest of the mouth. The reason for this is that a tongue would be of but little service to such animals, seeing that they are unable to chew their food or to taste it before swallowing, the pleasurable sensations they derive from it being limited to the act of deglutition. For it is in their passage down the gullet that solid edibles cause enjoyment, while it is by the tongue that the savour of fluids is perceived. Thus it is during deglutition that the oiliness, the heat, and other such qualities of food are recognized; and, in fact, the satisfaction from most solid edibles and dainties is derived almost entirely from the dilatation of the oesophagus during deglutition. This sensation, then, belongs even to animals that have no tongue, but while other animals have in addition the sensations of taste, tongueless animals have, we may say, no other satisfaction than it. What has now been said explains why intemperance as regards drinks and savoury fluids does not go hand in hand with intemperance as regards eating and solid relishes.

In some oviparous quadrupeds, namely in lizards, the tongue is bifid, as also it is in serpents, and its terminal divisions are of hair-like fineness, as has already been described. (Seals also have a forked tongue.) This it is which accounts for all these animals being so fond of dainty food. The teeth in the four-footed Ovipara are of the sharp interfitting kind, like the teeth of fishes. The organs of all the senses are present and resemble those of other animals. Thus there are nostrils for smell, eves for vision, and ears for hearing. The latter organs, however, do not project from the sides of the head, but consist simply of the duct, as also is the case in birds. This is due in both cases to the hardness of the integument; birds having their bodies covered with feathers, and these oviparous quadrupeds with horny plates. These plates are equivalent to scales, but of a harder character. This is manifest in tortoises and river crocodiles, and also in the large serpents. For here the plates become stronger

than the bones, being seemingly of the same substance as these.

These animals have no upper eyelid, but close the eye with the lower lid In this they resemble birds, and the reason is the same as was assigned in their case. Among birds there are some that can not only thus close the eye, but can also blink by means of a membrane which comes from its corner. But none of the oviparous quadrupeds blink; for their eyes are harder than those of birds. The reason for this is that keen vision and far-sightedness are of very considerable service to birds, flying as they do in the air, whereas they would be of comparatively small use to the oviparous quadrupeds, seeing that they are all of troglodytic habits.

Of the two separate portions which constitute the head, namely the upper part and the lower jaw, the latter in man and in the viviparous quadrupeds moves not only upwards and downwards, but also from side to side; while in fishes, and birds and oviparous quadrupeds, the only movement is up and down. The reason is that this latter movement is the one required in biting and dividing food, while the lateral movement serve to reduce substances to a pulp. To such animals, therefore, as have grinder-teeth this lateral motion is of service; but to those animals that have no grinders it would be quite useless, and they are therefore invariably without it. For nature never makes anything that is superfluous. While in all other animals it is the lower jaw that is movable, in the river crocodile it is exceptionally the upper. This is because the feet in this creature are so excessively small as to be useless for seizing and holding prey; on which account nature has given it a mouth that can serve for these purposes in their stead. For that direction of motion which will give the greater force to a blow will be the more serviceable one in holding or in seizing prey; and a blow from above is always more forcible than one from below. Seeing,

then, that both the prehension and the mastication of food are offices of the mouth, and that the former of these two is the more essential in an animal that has neither hands nor suitably formed feet, these crocodiles will derive greater benefit from a motion of the upper jaw downwards than from a motion of the lower jaw upwards. The same considerations explain why crabs also move the upper division of each claw and not the lower. For their claws are substitutes for hands, and so require to be suitable for the prehension of food, and not for its comminution; for such comminution and biting is the office of teeth. In crabs, then, and in such other animals as are able to seize their food in a leisurely manner, inasmuch as their mouth is not called on to perform its office while they are still in the water, the two functions are assigned to different parts, prehension to the hands or feet, biting and comminution of food to the mouth. But in crocodiles the mouth has been so framed by nature as to serve both purposes, the jaws being made to move in the manner just described.

Another part present in these animals is a neck, this being the necessary consequence of their having a lung. For the windpipe by which the air is admitted to the lung is of some length. If, however, the definition of a neck be correct, which calls it the portion between the head and the shoulders, a serpent can scarcely be said with the same right as the rest of these animals to have a neck, but only to have something analogous to that part of the body. It is a peculiarity of serpents, as compared with other animals allied to them, that they are able to turn their head backwards without stirring the rest of the body. The reason of this is that a serpent, like an insect, has a body that admits of being curled up, its vertebrae being cartilaginous and easily bent. The faculty in question belongs then to serpents simply as a necessary consequence of this character of their vertebrae; but at the same time it has a final cause, for it enables them to guard against attacks from behind. For their body, owing to its

length and the absence of feet, is ill-suited for turning round and protecting the hinder parts; and merely to lift the head, without the power of turning it round, would be of no use whatsoever.

The animals with which we are dealing have, moreover, a part which corresponds to the breast; but neither here nor elsewhere in their body have they any mammae, as neither has any bird or fish. This is a consequence of their having no milk; for a mamma is a receptacle for milk and, as it were, a vessel to contain it. This absence of milk is not peculiar to these animals, but is common to all such as are not internally viviparous. For all such produce eggs, and the nutriment which in Vivipara has the character of milk is in them engendered in the egg. Of all this, however, a clearer account will be given in the treatise on Generation. As to the mode in which the legs bend, a general account, in which all animals are considered, has already been given in the dissertation on Progression. These animals also have a tail, larger in some of them, smaller in others, and the reason for this has been stated in general terms in an earlier passage.

Of all oviparous animals that live on land there is none so lean as the Chamaeleon. For there is none that has so little blood. The explanation of this is to be found in the psychical temperament of the creature. For it is of a timid nature, as the frequent changes it undergoes in its outward aspect testify. But fear is a refrigeration, and results from deficiency of natural heat and scantiness of blood. We have now done with such sanguineous animals as are quadrupedous and also such as are apodous, and have stated with sufficient completeness what external parts they possess, and for what reason they have them.

12

The differences of birds compared one with another are differences of magnitude, and of the greater or smaller development of parts. Thus some have long legs, others short legs; some have a broad tongue, others a narrow tongue; and so on with the other parts. There are few of their parts that differ save in size, taking birds by themselves. But when birds are compared with other animals the parts present differences of form also. For in some animals these are hairy, in others scaly, and in others have scale-like plates, while birds are feathered.

Birds, then, are feathered, and this is a character common to them all and peculiar to them. Their feathers, too, are split and distinct in kind from the undivided feathers of insects; for the bird's feather is barbed, these are not; the bird's feather has a shaft, these have none. A second strange peculiarity which distinguishes birds from all other animals is their beak. For as in elephants the nostril serves in place of hands, and as in some insects the tongue serves in place of mouth, so in birds there is a beak, which, being bony, serves in place of teeth and lips. Their organs of sense have already been considered.

All birds have a neck extending from the body; and the purpose of this neck is the same as in such other animals as have one. This neck in some birds is long, in others short; its length, as a general rule, being pretty nearly determined by that of the legs. For long-legged birds have a long neck, short-legged birds a short one, to which rule, however, the web-footed birds form an exception. For to a bird perched up on long legs a short neck would be of no use whatsoever in collecting food from the ground; and equally useless would be a long neck, if the legs were short. Such birds, again, as are carnivorous would find length in this part interfere greatly with their habits of life. For a

long neck is weak, and it is on their superior strength that carnivorous birds depend for their subsistence. No bird, therefore, that has talons ever has an elongated neck. In web-footed birds, however, and in those other birds belonging to the same class, whose toes though actually separate have flat marginal lobes, the neck is elongated, so as to be suitable for collecting food from the water; while the legs are short, so as to serve in swimming. The beaks of birds, as their feet, vary with their modes of life. For in some the beak is straight, in others crooked; straight, in those who use it merely for eating; crooked, in those that live on raw flesh. For a crooked beak is an advantage in fighting; and these birds must, of course, get their food from the bodies of other animals, and in most cases by violence. In such birds, again, as live in marshes and are herbivorous the beak is broad and flat, this form being best suited for digging and cropping, and for pulling up plants. In some of these marsh birds, however, the beak is elongated, as too is the neck, the reason for this being that the bird get its food from some depth below the surface. For most birds of this kind, and most of those whose feet are webbed, either in their entirety or each part separately, live by preying on some of the smaller animals that are to be found in water, and use these parts for their capture, the neck acting as a fishing-rod, and the beak representing the line and hook.

The upper and under sides of the body, that is of what in quadrupeds is called the trunk, present in birds one unbroken surface, and they have no arms or forelegs attached to it, but in their stead wings, which are a distinctive peculiarity of these animals; and, as these wings are substitutes for arms, their terminal segments lie on the back in the place of a shoulder-blade.

The legs are two in number, as in man; not however, as in man, bent outwards, but bent inwards like the legs of a quadruped.

The wings are bent like the forelegs of a quadruped, having their convexity turned outwards. That the feet should be two in number is a matter of necessity. For a bird is essentially a sanguineous animal, and at the same time essentially a winged animal; and no sanguineous animal has more than four points for motion In birds, then, as in those other sanguineous animals that live and move upon the ground, the limbs attached to the trunk are four in number. But, while in all the rest these four limbs consist of a pair of arms and a pair of legs, or of four legs as in quadrupeds, in birds the arms or forelegs are replaced by a pair of wings, and this is their distinctive character. For it is of the essence of a bird that it shall be able to fly; and it is by the extension of wings that this is made possible. Of all arrangements, then, the only possible, and so the necessary, one is that birds shall have two feet; for this with the wings will give them four points for motion. The breast in all birds is sharp-edged, and fleshy. The sharp edge is to minister to flight, for broad surfaces move with considerable difficulty, owing to the large quantity of air which they have to displace; while the fleshy character acts as a protection, for the breast, owing to its form, would be weak, were it not amply covered.

Below the breast lies the belly, extending, as in quadrupeds and in man, to the vent and to the place where the legs are jointed to the trunk.

Such, then, are the parts which lie between the wings and the legs. Birds like all other animals, whether produced viviparously or from eggs, have an umbilicus during their development, but, when the bird has attained to fuller growth, no signs of this remain visible. The cause of this is plainly to be seen during the process of development; for in birds the umbilical cord unites with the intestine, and is not a portion of the vascular system, as is the case in viviparous animals.

Some birds, again, are well adapted for flight, their wings being large and strong. Such, for instance, are those that have talons and live on flesh. For their mode of life renders the power of flight a necessity, and it is on this account that their feathers are so abundant and their wings so large. Besides these, however, there are also other genera of birds that can fly well; all those, namely, that depend on speed for security, or that are of migratory habits. On the other hand, some kinds of birds have heavy bodies and are not constructed for flight. These are birds that are frugivorous and live on the ground, or that are able to swim and get their living in watery places. In those that have talons the body, without the wings, is small; for the nutriment is consumed in the production of these wings, and of the weapons and defensive appliances; whereas in birds that are not made for flight the contrary obtains, and the body is bulky and so of heavy weight. In some of these heavy-bodied birds the legs are furnished with what are called spurs, which replace the wings as a means of defence. Spurs and talons never co-exist in the same bird. For nature never makes anything superfluous; and if a bird can fly, and has talons, it has no use for spurs; for these are weapons for fighting on the ground, and on this account are an appanage of certain heavy-bodied birds. These latter, again, would find the possession of talons not only useless but actually injurious; for the claws would stick into the ground and interfere with progression. This is the reason why all birds with talons walk so badly, and why they never settle upon rocks. For the character of their claws is ill-suited for either action.

All this is the necessary consequence of the process of development. For the earthy matter in the body issuing from it is converted into parts that are useful as weapons. That which flows upwards gives hardness or size to the beak; and, should any flow downwards, it either forms spurs upon the legs or gives size and strength to the claws upon the feet. But it does

not at one and the same time produce both these results, one in the legs, the other in the claws; for such a dispersion of this residual matter would destroy all its efficiency. In other birds this earthy residue furnishes the legs with the material for their elongation; or sometimes, in place of this, fills up the interspaces between the toes. Thus it is simply a matter of necessity, that such birds as swim shall either be actually web-footed, or shall have a kind of broad blade-like margin running along the whole length of each distinct toe. The forms, then, of these feet are simply the necessary results of the causes that have been mentioned. Yet at the same time they are intended for the animal's advantage. For they are in harmony with the mode of life of these birds, who, living on the water, where their wings are useless, require that their feet shall be such as to serve in swimming. For these feet are so developed as to resemble the oars of a boat, or the fins of a fish; and the destruction of the foot-web has the same effect as the destruction of the fins; that is to say, it puts an end to all power of swimming.

In some birds the legs are very long, the cause of this being that they inhabit marshes. I say the cause, because nature makes the organs for the function, and not the function for the organs. It is, then, because these birds are not meant for swimming that their feet are without webs, and it is because they live on ground that gives way under the foot that their legs and toes are elongated, and that these latter in most of them have an extra number of joints. Again, though all birds have the same material composition, they are not all made for flight; and in these, therefore, the nutriment that should go to their tail-feathers is spent on the legs and used to increase their size. This is the reason why these birds when they fly make use of their legs as a tail, stretching them out behind, and so rendering them serviceable, whereas in any other position they would be simply an impediment.

In other birds, where the legs are short, these are held close against the belly during flight. In some cases this is merely to keep the feet out of the way, but in birds that have talons the position has a further purpose, being the one best suited for rapine. Birds that have a long and a thick neck keep it stretched out during flight; but those whose neck though long is slender fly with it coiled up. For in this position it is protected, and less likely to get broken, should the bird fly against any obstacle.

In all birds there is an ischium, but so placed and of such length that it would scarcely be taken for an ischium, but rather for a second thigh-bone; for it extends as far as to the middle of the belly. The reason for this is that the bird is a biped, and yet is unable to stand erect. For if its ischium extended but a short way from the fundament, and then immediately came the leg, as is the case in man and in quadrupeds, the bird would be unable to stand up at all. For while man stands erect, and while quadrupeds have their heavy bodies propped up in front by the forelegs, birds can neither stand erect owing to their dwarf-like shape, nor have anterior legs to prop them up, these legs being replaced by wings. As a remedy for this Nature has given them a long ischium, and brought it to the centre of the body, fixing it firmly; and she has placed the legs under this central point, that the weight on either side may be equally balanced, and standing or progression rendered possible. Such then is the reason why a bird, though it is a biped, does not stand erect. Why its legs are destitute of flesh has also already been stated; for the reasons are the same as in the case of quadrupeds.

In all birds alike, whether web-footed or not, the number of toes in each foot is four. For the Libyan ostrich may be disregarded for the present, and its cloven hoof and other discrepancies of structure as compared with the tribe of birds will be considered further on. Of these four toes three are in front, while the fourth points backward, serving, as a heel, to give steadiness. In the

long-legged birds this fourth toe is much shorter than the others, as is the case with the Crex, but the number of their toes is not increased. The arrangement of the toes is such as has been described in all birds with the exception of the wryneck. Here only two of the toes are in front, the other two behind; and the reason for this is that the body of the wryneck is not inclined forward so much as that of other birds. All birds have testicles; but they are inside the body. The reason for this will be given in the treatise On the Generation of Animals.

13

Thus then are fashioned the parts of birds. But in fishes a still further stunting has occurred in the external parts. For here, for reasons already given, there are neither legs nor hands nor wings, the whole body from head to tail presenting one unbroken surface. This tail differs in different fishes, in some approximating in character to the fins, while in others, namely in some of the flat kinds, it is spinous and elongated, because the material which should have gone to the tail has been diverted thence and used to increase the breadth of the body. Such, for instance, is the case with the Torpedos, the Trygons, and whatever other Selachia there may be of like nature. In such fishes, then, the tail is spinous and long; while in some others it is short and fleshy, for the same reason which makes it spinous and long in the Torpedo. For to be short and fleshy comes to the same thing as to be long and less amply furnished with flesh.

What has occurred in the Fishing-frog is the reverse of what has occurred in the other instances just given. For here the anterior and broad part of the body is not of a fleshy character, and so all

the fleshy substance which has been thence diverted has been placed by nature in the tail and hinder portion of the body.

In fishes there are no limbs attached to the body. For in accordance with their essential constitution they are swimming animals; and nature never makes anything superfluous or void of use. Now inasmuch as fishes are made swimming they have fins, and as they are not made for walking they are without feet; for feet are attached to the body that they may be of use in progression on land. Moreover, fishes cannot have feet, or any other similar limbs, as well as four fins; for they are essentially sanguineous animals. The Cordylus, though it has gills, has feet, for it has no fins but merely has its tail flattened out and loose in texture.

Fishes, unless, like the Batos and the Trygon, they are broad and flat, have four fins, two on the upper and two on the under side of the body; and no fish ever has more than these. For, if it had, it would be a bloodless animal.

The upper pair of fins is present in nearly all fishes, but not so the under pair; for these are wanting in some of those fishes that have long thick bodies, such as the eel, the conger, and a certain kind of Cestreus that is found in the lake at Siphae. When the body is still more elongated, and resembles that of a serpent rather than that of a fish, as is the case in the Smuraena, there are absolutely no fins at all; and locomotion is effected by the flexures of the body, the water being put to the same use by these fishes as is the ground by serpents. For serpents swim in water exactly in the same way as they glide on the ground. The reason for these serpent-like fishes being without fins is the same as that which causes serpents to be without feet; and what this is has been already stated in the dissertations on the Progression and the Motion of Animals. The reason was this. If the points of motion were four, motion would

be effected under difficulties; for either the two pairs of fins would be close to each other, in which case motion would scarcely be possible, or they would be at a very considerable distance apart, in which case the long interval between them would be just as great an evil. On the other hand, to have more than four such motor points would convert the fishes into bloodless animals. A similar explanation applies to the case of those fishes that have only two fins. For here again the body is of great length and like that of a serpent, and its undulations do the office of the two missing fins. It is owing to this that such fishes can even crawl on dry ground, and can live there for a considerable time; and do not begin to gasp until they have been for a considerable time out of the water, while others, whose nature is akin to that of land-animals, do not even do as much as that. In such fishes as have but two fins it is the upper pair (pectorals) that is present, excepting when the flat broad shape of the body prevents this. The fins in such cases are placed at the head, because in this region there is no elongation, which might serve in the absence of fins as a means of locomotion; whereas in the direction of the tail there is a considerable lengthening out in fishes of this conformation. As for the Bati and the like, they use the marginal part of their flattened bodies in place of fins for swimming.

In the Torpedo and the Fishing-frog the breadth of the anterior part of the body is not so great as to render locomotion by fins impossible, but in consequence of it the upper pair (pectorals) are placed further back and the under pair (ventrals) are placed close to the head, while to compensate for this advancement they are reduced in size so as to be smaller than the upper ones. In the Torpedo the two upper fins (pectorals) are placed on the tail, and the fish uses the broad expansion of its body to supply their place, each lateral half of its circumference serving the office of a fin.

The head, with its several parts, as also the organs of sense, have already come under consideration.

There is one peculiarity which distinguishes fishes from all other sanguineous animals, namely, the possession of gills. Why they have these organs has been set forth in the treatise on Respiration. These gills are in most fishes covered by opercula, but in the Selachia, owing to the skeleton being cartilaginous, there are no such coverings. For an operculum requires fish-spine for its formation, and in other fishes the skeleton is made of this substance, whereas in the Selachia it is invariably formed of cartilage. Again, while the motions of spinous fishes are rapid, those of the Selachia are sluggish, inasmuch as they have neither fish-spine nor sinew; but an operculum requires rapidity of motion, seeing that the office of the gills is to minister as it were to expiration. For this reason in Selachia the branchial orifices themselves effect their own closure, and thus there is no need for an operculum to ensure its taking place with due rapidity. In some fishes the gills are numerous, in others few in number; in some again they are double, in others single. The last gill in most cases is single. For a detailed account of all this, reference must be made to the treatises on Anatomy, and to the book of Researches concerning Animals.

It is the abundance or the deficiency of the cardiac heat which determines the numerical abundance or deficiency of the gills. For, the greater an animal's heat, the more rapid and the more forcible does it require the branchial movement to be; and numerous and double gills act with more force and rapidity than such as are few and single. Thus, too, it is that some fishes that have but few gills, and those of comparatively small efficacy, can live out of water for a considerable time; for in them there is no great demand for refrigeration. Such, for example, are the eel and all other fishes of serpent-like form.

Fishes also present diversities as regards the mouth. For in some this is placed in front, at the very extremity of the body, while in others, as the dolphin and the Selachia, it is placed on the under surface; so that these fishes turn on the back in order to take their food. The purpose of Nature in this was apparently not merely to provide a means of salvation for other animals, by allowing them opportunity of escape during the time lost in the act of turning – for all the fishes with this kind of mouth prey on living animals – but also to prevent these fishes from giving way too much to their gluttonous ravening after food. For had they been able to seize their prey more easily than they do, they would soon have perished from over-repletion. An additional reason is that the projecting extremity of the head in these fishes is round and small, and therefore cannot admit of a wide opening.

Again, even when the mouth is not placed on the under surface, there are differences in the extent to which it can open. For in some cases it can gape widely, while in others it is set at the point of a small tapering snout; the former being the case in carnivorous fishes, such as those with sharp interfitting teeth, whose strength lies in their mouth, while the latter is its form in all such as are not carnivorous.

The skin is in some fishes covered with scales (the scale of a fish is a thin and shiny film, and therefore easily becomes detached from the surface of the body). In others it is rough, as for instance in the Rhine, the Batos, and the like. Fewest of all are those whose skin is smooth. The Selachia have no scales, but a rough skin. This is explained by their cartilaginous skeleton. For the earthy material which has been thence diverted is expended by nature upon the skin.

No fish has testicles either externally or internally; as indeed have no apodous animals, among which of course are included

the serpents. One and the same orifice serves both for the excrement and for the generative secretions, as is the case also in all other oviparous animals, whether two-footed or four-footed, inasmuch as they have no urinary bladder and form no fluid excretion.

Such then are the characters which distinguish fishes from all other animals. But dolphins and whales and all such Cetacea are without gills; and, having a lung, are provided with a blow-hole; for this serves them to discharge the sea-water which has been taken into the mouth. For, feeding as they do in the water, they cannot but let this fluid enter into their mouth, and, having let it in, they must of necessity let it out again. The use of gills, however, as has been explained in the treatise on Respiration, is limited to such animals as do not breathe; for no animal can possibly possess gills and at the same time be a respiratory animal. In order, therefore, that these Cetacea may discharge the water, they are provided with a blow-hole. This is placed in front of the brain; for otherwise it would have cut off the brain from the spine. The reason for these animals having a lung and breathing, is that animals of large size require an excess of heat, to facilitate their motion. A lung, therefore, is placed within their body, and is fully supplied with blood-heat. These creatures are after a fashion land and water animals in one. For so far as they are inhalers of air they resemble land-animals, while they resemble water-animals in having no feet and in deriving their food from the sea. So also seals lie halfway between land and water animals, and bats half-way between animals that live on the ground and animals that fly; and so belong to both kinds or to neither. For seals, if looked on as water-animals, are yet found to have feet; and, if looked on as land-animals, are yet found to have fins. For their hind feet are exactly like the fins of fishes; and their teeth also are sharp and interfitting as in fishes. Bats again, if regarded as winged animals, have feet; and, if regarded as quadrupeds, are without

them. So also they have neither the tail of a quadruped nor the tail of a bird; no quadruped's tail, because they are winted animals; no bird's tail, because they are terrestrial. This absence of tail is the result of necessity. For bats fly by means of a membrane, but no animal, unless it has barbed feathers, has the tail of a bird; for a bird's tail is composed of such feathers. As for a quadruped's tail, it would be an actual impediment, if present among the feathers.

14

Much the same may be said also of the Libyan ostrich. For it has some of the characters of a bird, some of the characters of a quadruped. It differs from a quadruped in being feathered; and from a bird in being unable to soar aloft and in having feathers that resemble hair and are useless for flight. Again, it agrees with quadrupeds in having upper eyelashes, which are the more richly supplied with hairs because the parts about the head and the upper portion of the neck are bare; and it agrees with birds in being feathered in all the parts posterior to these. Further, it resembles a bird in being a biped, and a quadruped in having a cloven hoof; for it has hoofs and not toes. The explanation of these peculiarities is to be found in its bulk, which is that of a quadruped rather than that of a bird. For, speaking generally, a bird must necessarily be of very small size. For a body of heavy bulk can with difficulty be raised into the air.

Thus much then as regards the parts of animals. We have discussed them all, and set forth the cause why each exists; and in so doing we have severally considered each group of animals. We must now pass on, and in due sequence must next deal with the question of their generation.

Aristotle - On the Motion of Animals

[Translated by A. S. L. Farquharson]

1

Elsewhere we have investigated in detail the movement of animals after their various kinds, the differences between them, and the reasons for their particular characters (for some animals fly, some swim, some walk, others move in various other ways); there remains an investigation of the common ground of any sort of animal movement whatsoever.

Now we have already determined (when we were discussing whether eternal motion exists or not, and its definition, if it does exist) that the origin of all other motions is that which moves itself, and that the origin of this is the immovable, and that the prime mover must of necessity be immovable. And we must grasp this not only generally in theory, but also by reference to individuals in the world of sense, for with these in view we seek general theories, and with these we believe that general theories ought to harmonize. Now in the world of sense too it is plainly impossible for movement to be initiated if there is nothing at rest, and before all else in our present subject – animal life. For if one of the parts of an animal be moved, another must be at rest, and this is the purpose of their joints; animals use joints like a centre, and the whole member, in which the joint is, becomes both one and two, both straight and bent, changing potentially and actually by reason of the joint. And when it is bending and being moved one of the points in the joint is moved and one is at rest, just as if the points A and D of a diameter were at rest, and B were moved, and DAC were

generated. However, in the geometrical illustration, the centre is held to be altogether indivisible (for in mathematics motion is a fiction, as the phrase goes, no mathematical entity being really moved), whereas in the case of joints the centres become now one potentially and divided actually, and now one actually and divided potentially. But still the origin of movement, qua origin, always remains at rest when the lower part of a limb is moved; for example, the elbow joint, when the forearm is moved, and the shoulder, when the whole arm; the knee when the tibia is moved, and the hip when the whole leg. Accordingly it is plain that each animal as a whole must have within itself a point at rest, whence will be the origin of that which is moved, and supporting itself upon which it will be moved both as a complete whole and in its members.

2

But the point of rest in the animal is still quite ineffectual unless there be something without which is absolutely at rest and immovable. Now it is worth while to pause and consider what has been said, for it involves a speculation which extends beyond animals even to the motion and march of the universe. For just as there must be something immovable within the animal, if it is to be moved, so even more must there be without it something immovable, by supporting itself upon which that which is moved moves. For were that something always to give way (as it does for mice walking in grain or persons walking in sand) advance would be impossible, and neither would there be any walking unless the ground were to remain still, nor any flying or swimming were not the air and the sea to resist. And this which resists must needs be different from what is moved, the whole of it from the whole of that, and what is thus

immovable must be no part of what is moved; otherwise there will be no movement. Evidence of this lies in the problem why it is that a man easily moves a boat from outside, if he push with a pole, putting it against the mast or some other part, but if he tried to do this when in the boat itself he would never move it, no not giant Tityus himself nor Boreas blowing from inside the ship, if he really were blowing in the way painters represent him; for they paint him sending the breath out from the boat. For whether one blew gently or so stoutly as to make a very great wind, and whether what were thrown or pushed were wind or something else, it is necessary in the first place to be supported upon one of one's own members which is at rest and so to push, and in the second place for this member, either itself, or that of which it is a part, to remain at rest, fixing itself against something external to itself. Now the man who is himself in the boat, if he pushes, fixing himself against the boat, very naturally does not move the boat, because what he pushes against should properly remain at rest. Now what he is trying to move, and what he is fixing himself against is in his case the same. If, however, he pushes or pulls from outside he does move it, for the ground is no part of the boat.

3

Here we may ask the difficult question whether if something moves the whole heavens this mover must be immovable, and moreover be no part of the heavens, nor in the heavens. For either it is moved itself and moves the heavens, in which case it must touch something immovable in order to create movement, and then this is no part of that which creates movement; or if the mover is from the first immovable it will equally be no part of that which is moved. In this point at least they argue

correctly who say that as the Sphere is carried round in a circle no single part remains still, for then either the whole would necessarily stand still or its continuity be torn asunder; but they argue less well in supposing that the poles have a certain force, though conceived as having no magnitude, but as merely termini or points. For besides the fact that no such things have any substantial existence it is impossible for a single movement to be initiated by what is twofold; and yet they make the poles two. From a review of these difficulties we may conclude that there is something so related to the whole of Nature, as the earth is to animals and things moved by them.

And the mythologists with their fable of Atlas setting his feet upon the earth appear to have based the fable upon intelligent grounds. They make Atlas a kind of diameter twirling the heavens about the poles. Now as the earth remains still this would be reasonable enough, but their theory involves them in the position that the earth is no part of the universe. And further the force of that which initiates movement must be made equal to the force of that which remains at rest. For there is a definite quantity of force or power by dint of which that which remains at rest does so, just as there is of force by dint of which that which initiates movement does so; and as there is a necessary proportion between opposite motions, so there is between absences of motion. Now equal forces are unaffected by one another, but are overcome by a superiority of force. And so in their theory Atlas, or whatever similar power initiates movement from within, must exert no more force than will exactly balance the stability of the earth – otherwise the earth will be moved out of her place in the centre of things. For as the pusher pushes so is the pushed pushed, and with equal force. But the prime mover moves that which is to begin with at rest, so that the power it exerts is greater, rather than equal and like to the power which produces absence of motion in that which is moved. And similarly also the power of what is moved and so

moves must be greater than the power of that which is moved but does not initiate movement. Therefore the force of the earth in its immobility will have to be as great as the force of the whole heavens, and of that which moves the heavens. But if that is impossible, it follows that the heavens cannot possibly be moved by any force of this kind inside them.

4

There is a further difficulty about the motions of the parts of the heavens which, as akin to what has gone before, may be considered next. For if one could overcome by force of motion the immobility of the earth he would clearly move it away from the centre. And it is plain that the power from which this force would originate will not be infinite, for the earth is not infinite and therefore its weight is not. Now there are more senses than one of the word 'impossible'. When we say it is impossible to see a sound, and when we say it is impossible to see the men in the moon, we use two senses of the word; the former is of necessity, the latter, though their nature is to be seen, cannot as a fact be seen by us. Now we suppose that the heavens are of necessity impossible to destroy and to dissolve, whereas the result of the present argument would be to do away with this necessity. For it is natural and possible for a motion to exist greater than the force by dint of which the earth is at rest, or than that by dint of which Fire and Aether are moved. If then there are superior motions, these will be dissolved in succession by one another: and if there actually are not, but might possibly be (for the earth cannot be infinite because no body can possibly be infinite), there is a possibility of the heavens being dissolved. For what is to prevent this coming to pass, unless it

be impossible? And it is not impossible unless the opposite is necessary. This difficulty, however, we will discuss elsewhere.

To resume, must there be something immovable and at rest outside of what is moved, and no part of it, or not? And must this necessarily be so also in the case of the universe? Perhaps it would be thought strange were the origin of movement inside. And to those who so conceive it the word of Homer would appear to have been well spoken:

'Nay, ye would not pull Zeus, highest of all from heaven to the plain, no not even if ye toiled right hard; come, all ye gods and goddesses! Set hands to the chain'; for that which is entirely immovable cannot possibly be moved by anything. And herein lies the solution of the difficulty stated some time back, the possibility or impossibility of dissolving the system of the heavens, in that it depends from an original which is immovable.

Now in the animal world there must be not only an immovable without, but also within those things which move in place, and initiate their own movement. For one part of an animal must be moved, and another be at rest, and against this the part which is moved will support itself and be moved; for example, if it move one of its parts; for one part, as it were, supports itself against another part at rest.

But about things without life which are moved one might ask the question whether all contain in themselves both that which is at rest and that which initiates movement, and whether they also, for instance fire, earth, or any other inanimate thing, must support themselves against something outside which is at rest. Or is this impossible and must it not be looked for rather in those primary causes by which they are set in motion? For all things without life are moved by something other, and the origin of all things so moved are things which move themselves.

And out of these we have spoken about animals (for they must all have in themselves that which is at rest, and without them that against which they are supported); but whether there is some higher and prime mover is not clear, and an origin of that kind involves a different discussion. Animals at any rate which move themselves are all moved supporting themselves on what is outside them, even when they inspire and expire; for there is no essential difference between casting a great and a small weight, and this is what men do when they spit and cough and when they breathe in and breathe out.

5

But is it only in that which moves itself in place that there must be a point at rest, or does this hold also of that which causes its own qualitative changes, and its own growth? Now the question of original generation and decay is different; for if there is, as we hold, a primary movement, this would be the cause of generation and decay, and probably of all the secondary movements too. And as in the universe, so in the animal world this is the primary movement, when the creature attains maturity; and therefore it is the cause of growth, when the creature becomes the cause of its own growth, and the cause too of alteration. But if this is not the primary movement then the point at rest is not necessary. However, the earliest growth and alteration in the living creature arise through another and by other channels, nor can anything possibly be the cause of its own generation and decay, for the mover must exist before the moved, the begetter before the begotten, and nothing is prior to itself.

6

Now whether the soul is moved or not, and how it is moved if it be moved, has been stated before in our treatise concerning it. And since all inorganic things are moved by some other thing – and the manner of the movement of the first and eternally moved, and how the first mover moves it, has been determined before in our Metaphysics, it remains to inquire how the soul moves the body, and what is the origin of movement in a living creature. For, if we except the movement of the universe, things with life are the causes of the movement of all else, that is of all that are not moved by one another by mutual impact. And so all their motions have a term or limit, inasmuch as the movements of things with life have such. For all living things both move and are moved with some object, so that this is the term of all their movement, the end, that is, in view. Now we see that the living creature is moved by intellect, imagination, purpose, wish, and appetite. And all these are reducible to mind and desire. For both imagination and sensation are on common ground with mind, since all three are faculties of judgement though differing according to distinctions stated elsewhere. Will, however, impulse, and appetite, are all three forms of desire, while purpose belongs both to intellect and to desire. Therefore the object of desire or of intellect first initiates movement, not, that is, every object of intellect, only the end in the domain of conduct. Accordingly among goods that which moves is a practical end, not the good in its whole extent. For it initiates movement only so far as something else is for its sake, or so far as it is the object of that which is for the sake of something else. And we must suppose that a seeming good may take the room of actual good, and so may the pleasant, which is itself a seeming good. From these considerations it is clear that in one regard that which is eternally moved by the eternal mover is

moved in the same way as every living creature, in another regard differently, and so while it is moved eternally, the movement of living creatures has a term. Now the eternal beautiful, and the truly and primarily good (which is not at one time good, at another time not good), is too divine and precious to be relative to anything else. The prime mover then moves, itself being unmoved, whereas desire and its faculty are moved and so move. But it is not necessary for the last in the chain of things moved to move something else; wherefore it is plainly reasonable that motion in place should be the last of what happens in the region of things happening, since the living creature is moved and goes forward by reason of desire or purpose, when some alteration has been set going on the occasion of sensation or imagination.

7

But how is it that thought (viz. sense, imagination, and thought proper) is sometimes followed by action, sometimes not; sometimes by movement, sometimes not? What happens seems parallel to the case of thinking and inferring about the immovable objects of science. There the end is the truth seen (for, when one conceives the two premisses, one at once conceives and comprehends the conclusion), but here the two premisses result in a conclusion which is an action – for example, one conceives that every man ought to walk, one is a man oneself: straightway one walks; or that, in this case, no man should walk, one is a man: straightway one remains at rest. And one so acts in the two cases provided that there is nothing in the one case to compel or in the other to prevent. Again, I ought to create a good, a house is good: straightway I make a house. I need a covering, a coat is a covering: I need a

coat. What I need I ought to make, I need a coat: I make a coat. And the conclusion I must make a coat is an action. And the action goes back to the beginning or first step. If there is to be a coat, one must first have B, and if B then A, so one gets A to begin with. Now that the action is the conclusion is clear. But the premisses of action are of two kinds, of the good and of the possible.

And as in some cases of speculative inquiry we suppress one premise so here the mind does not stop to consider at all an obvious minor premise; for example if walking is good for man, one does not dwell upon the minor 'I am a man'. And so what we do without reflection, we do quickly. For when a man actualizes himself in relation to his object either by perceiving, or imagining or conceiving it, what he desires he does at once. For the actualizing of desire is a substitute for inquiry or reflection. I want to drink, says appetite; this is drink, says sense or imagination or mind: straightway I drink. In this way living creatures are impelled to move and to act, and desire is the last or immediate cause of movement, and desire arises after perception or after imagination and conception. And things that desire to act now create and now act under the influence of appetite or impulse or of desire or wish.

The movements of animals may be compared with those of automatic puppets, which are set going on the occasion of a tiny movement; the levers are released, and strike the twisted strings against one another; or with the toy wagon. For the child mounts on it and moves it straight forward, and then again it is moved in a circle owing to its wheels being of unequal diameter (the smaller acts like a centre on the same principle as the cylinders). Animals have parts of a similar kind, their organs, the sinewy tendons to wit and the bones; the bones are like the wooden levers in the automaton, and the iron; the tendons are like the strings, for when these are tightened or leased

movement begins. However, in the automata and the toy wagon there is no change of quality, though if the inner wheels became smaller and greater by turns there would be the same circular movement set up. In an animal the same part has the power of becoming now larger and now smaller, and changing its form, as the parts increase by warmth and again contract by cold and change their quality. This change of quality is caused by imaginations and sensations and by ideas. Sensations are obviously a form of change of quality, and imagination and conception have the same effect as the objects so imagined and conceived For in a measure the form conceived be it of hot or cold or pleasant or fearful is like what the actual objects would be, and so we shudder and are frightened at a mere idea. Now all these affections involve changes of quality, and with those changes some parts of the body enlarge, others grow smaller. And it is not hard to see that a small change occurring at the centre makes great and numerous changes at the circumference, just as by shifting the rudder a hair's breadth you get a wide deviation at the prow. And further, when by reason of heat or cold or some kindred affection a change is set up in the region of the heart, even in an imperceptibly small part of the heart, it produces a vast difference in the periphery of the body, – blushing, let us say, or turning white, goose-skin and shivers and their opposites.

8

But to return, the object we pursue or avoid in the field of action is, as has been explained, the original of movement, and upon the conception and imagination of this there necessarily follows a change in the temperature of the body. For what is painful we avoid, what is pleasing we pursue. We are, however,

unconscious of what happens in the minute parts; still anything painful or pleasing is generally speaking accompanied by a definite change of temperature in the body. One may see this by considering the affections. Blind courage and panic fears, erotic motions, and the rest of the corporeal affections, pleasant and painful, are all accompanied by a change of temperature, some in a particular member, others in the body generally. So, memories and anticipations, using as it were the reflected images of these pleasures and pains, are now more and now less causes of the same changes of temperature. And so we see the reason of nature's handiwork in the inward parts, and in the centres of movement of the organic members; they change from solid to moist, and from moist to solid, from soft to hard and vice versa. And so when these are affected in this way, and when besides the passive and active have the constitution we have many times described, as often as it comes to pass that one is active and the other passive, and neither of them falls short of the elements of its essence, straightway one acts and the other responds. And on this account thinking that one ought to go and going are virtually simultaneous, unless there be something else to hinder action. The organic parts are suitably prepared by the affections, these again by desire, and desire by imagination. Imagination in its turn depends either upon conception or sense-perception. And the simultaneity and speed are due to the natural correspondence of the active and passive.

However, that which first moves the animal organism must be situate in a definite original. Now we have said that a joint is the beginning of one part of a limb, the end of another. And so nature employs it sometimes as one, sometimes as two. When movement arises from a joint, one of the extreme points must remain at rest, and the other be moved (for as we explained above the mover must support itself against a point at rest); accordingly, in the case of the elbow-joint, the last point of the

forearm is moved but does not move anything, while, in the flexion, one point of the elbow, which lies in the whole forearm that is being moved, is moved, but there must also be a point which is unmoved, and this is our meaning when we speak of a point which is in potency one, but which becomes two in actual exercise. Now if the arm were the living animal, somewhere in its elbow-joint would be situate the original seat of the moving soul. Since, however, it is possible for a lifeless thing to be so related to the hand as the forearm is to the upper (for example, when a man moves a stick in his hand), it is evident that the soul, the original of movement, could not lie in either of the two extreme points, neither, that is, in the last point of the stick which is moved, nor in the original point which causes movement. For the stick too has an end point and an originative point by reference to the hand. Accordingly, this example shows that the moving original which derives from the soul is not in the stick and if not, then not in the hand; for a precisely similar relation obtains between the hand and the wrist, as between the wrist and the elbow. In this matter it makes no difference whether the part is a continuous part of the body or not; the stick may be looked at as a detached part of the whole. It follows then of necessity that the original cannot lie in any individual origin which is the end of another member, even though there may lie another part outside the one in question. For example, relatively to the end point of the stick the hand is the original, but the original of the hand's movement is in the wrist. And so if the true original is not in the hand, be-there is still something higher up, neither is the true original in the wrist, for once more if the elbow is at rest the whole part below it can be moved as a continuous whole.

9

Now since the left and the right sides are symmetrical, and these opposites are moved simultaneously, it cannot be that the left is moved by the right remaining stationary, nor vice versa; the original must always be in what lies above both. Therefore, the original seat of the moving soul must be in that which lies in the middle, for of both extremes the middle is the limiting point; and this is similarly related to the movements from above [and below,] those that is from the head, and to the bones which spring from the spinal column, in creatures that have a spinal column.

And this is a reasonable arrangement. For the sensorium is in our opinion in the centre too; and so, if the region of the original of movement is altered in structure through sense-perception and thus changes, it carries with it the parts that depend upon it and they too are extended or contracted, and in this way the movement of the creature necessarily follows. And the middle of the body must needs be in potency one but in action more than one; for the limbs are moved simultaneously from the original seat of movement, and when one is at rest the other is moved. For example, in the line BAC, B is moved, and A is the mover. There must, however, be a point at rest if one is to move, the other to be moved. A (AE) then being one in potency must be two in action, and so be a definite spatial magnitude not a mathematical point. Again, C may be moved simultaneously with B. Both the originals then in A must move and be, and so there must be something other than them which moves but is not moved. For otherwise, when the movement begins, the extremes, i.e. the originals, in A would rest upon one another, like two men putting themselves back to back and so moving their legs. There must then be some one thing which moves both. This something is the soul, distinct from the spatial magnitude just described and yet located therein.

10

Although from the point of view of the definition of movement – a definition which gives the cause – desire is the middle term or cause, and desire moves being moved, still in the material animated body there must be some material which itself moves being moved. Now that which is moved, but whose nature is not to initiate movement, is capable of being passive to an external force, while that which initiates movement must needs possess a kind of force and power. Now experience shows us that animals do both possess connatural spirit and derive power from this. (How this connatural spirit is maintained in the body is explained in other passages of our works.) And this spirit appears to stand to the soul-centre or original in a relation analogous to that between the point in a joint which moves being moved and the unmoved. Now since this centre is for some animals in the heart, in the rest in a part analogous with the heart, we further see the reason for the connatural spirit being situate where it actually is found. The question whether the spirit remains always the same or constantly changes and is renewed, like the cognate question about the rest of the parts of the body, is better postponed. At all events we see that it is well disposed to excite movement and to exert power; and the functions of movement are thrusting and pulling. Accordingly, the organ of movement must be capable of expanding and contracting; and this is precisely the characteristic of spirit. It contracts and expands naturally, and so is able to pull and to thrust from one and the same cause, exhibiting gravity compared with the fiery element, and levity by comparison with the opposites of fire. Now that which is to initiate movement without change of structure must be of the kind described, for

the elementary bodies prevail over one another in a compound body by dint of disproportion; the light is overcome and kept down by the heavier, and the heavy kept up by the lighter.

We have now explained what the part is which is moved when the soul originates movement in the body, and what is the reason for this. And the animal organism must be conceived after the similitude of a well-governed commonwealth. When order is once established in it there is no more need of a separate monarch to preside over each several task. The individuals each play their assigned part as it is ordered, and one thing follows another in its accustomed order. So in animals there is the same orderliness – nature taking the place of custom – and each part naturally doing his own work as nature has composed them. There is no need then of a soul in each part, but she resides in a kind of central governing place of the body, and the remaining parts live by continuity of natural structure, and play the parts Nature would have them play.

11

So much then for the voluntary movements of animal bodies, and the reasons for them. These bodies, however, display in certain members involuntary movements too, but most often non-voluntary movements. By involuntary I mean motions of the heart and of the privy member; for often upon an image arising and without express mandate of the reason these parts are moved. By non-voluntary I mean sleep and waking and respiration, and other similar organic movements. For neither imagination nor desire is properly mistress of any of these; but since the animal body must undergo natural changes of quality, and when the parts are so altered some must increase and

other decrease, the body must straightway be moved and change with the changes that nature makes dependent upon one another. Now the causes of the movements are natural changes of temperature, both those coming from outside the body, and those taking place within it. So the involuntary movements which occur in spite of reason in the aforesaid parts occur when a change of quality supervenes. For conception and imagination, as we said above, produce the conditions necessary to affections, since they bring to bear the images or forms which tend to create these states. And the two parts aforesaid display this motion more conspicuously than the rest, because each is in a sense a separate vital organism, the reason being that each contains vital moisture. In the case of the heart the cause is plain, for the heart is the seat of the senses, while an indication that the generative organ too is vital is that there flows from it the seminal potency, itself a kind of organism. Again, it is a reasonable arrangement that the movements arise in the centre upon movements in the parts, and in the parts upon movements in the centre, and so reach one another. Conceive A to be the centre or starting point. The movements then arrive at the centre from each letter in the diagram we have drawn, and flow back again from the centre which is moved and changes, (for the centre is potentially multiple) the movement of B goes to B, that of C to C, the movement of both to both; but from B to C the movements flow by dint of going from B to A as to a centre, and then from A to C as from a centre.

Moreover a movement contrary to reason sometimes does and sometimes does not arise in the organs on the occasion of the same thoughts; the reason is that sometimes the matter which is passive to the impressions is there in sufficient quantity and of the right quality and sometimes not.

And so we have finished our account of the reasons for the parts of each kind of animal, of the soul, and furthere of sense-perception, of sleep, of memory, and of movement in general; it remains to speak of animal generation.

Aristotle - On the Gait of Animals

[Translated by A. S. L. Farquharson]

1

We have now to consider the parts which are useful to animals for movement in place (locomotion); first, why each part is such as it is and to what end they possess them; and second, the differences between these parts both in one and the same creature, and again by comparison of the parts of creatures of different species with one another. First then let us lay down how many questions we have to consider.

The first is what are the fewest points of motion necessary to animal progression, the second why sanguineous animals have four points and not more, but bloodless animals more than four, and generally why some animals are footless, others bipeds, others quadrupeds, others polypods, and why all have an even number of feet, if they have feet at all; why in fine the points on which progression depends are even in number.

Next, why are man and bird bipeds, but fish footless; and why do man and bird, though both bipeds, have an opposite curvature of the legs. For man bends his legs convexly, a bird has his bent concavely; again, man bends his arms and legs in opposite directions, for he has his arms bent convexly, but his legs concavely. And a viviparous quadruped bends his limbs in opposite directions to a man's, and in opposite directions to one another; for he has his forelegs bent convexly, his hind legs concavely. Again, quadrupeds which are not viviparous but oviparous have a peculiar curvature of the limbs laterally away

from the body. Again, why do quadrupeds move their legs criss-cross?

We have to examine the reasons for all these facts, and others cognate to them; that the facts are such is clear from our Natural History, we have now to ask reasons for the facts.

2

At the beginning of the inquiry we must postulate the principles we are accustomed constantly to use for our scientific investigation of nature, that is we must take for granted principles of this universal character which appear in all Nature's work. Of these one is that Nature creates nothing without a purpose, but always the best possible in each kind of living creature by reference to its essential constitution. Accordingly if one way is better than another that is the way of Nature. Next we must take for granted the different species of dimensions which inhere in various things; of these there are three pairs of two each, superior and inferior, before and behind, to the right and to the left. Further we must assume that the originals of movements in place are thrusts and pulls. (These are the essential place-movements, it is only accidentally that what is carried by another is moved; it is not thought to move itself, but to be moved by something else.)

3

After these preliminaries, we go on to the next questions in order.

Now of animals which change their position some move with the whole body at once, for example jumping animals, others move one part first and then the other, for example walking (and running) animals. In both these changes the moving creature always changes its position by pressing against what lies below it. Accordingly if what is below gives way too quickly for that which is moving upon it to lean against it, or if it affords no resistance at all to what is moving, the latter can of itself effect no movement upon it. For an animal which jumps makes its jump both by leaning against its own upper part and also against what is beneath its feet; for at the joints the parts do in a sense lean upon one another, and in general that which pushes down leans upon what is pushed down. That is why athletes jump further with weights in their hands than without, and runners run faster if they swing their arms; there is in extending the arms a kind of leaning against the hands and wrists. In all cases then that which moves makes its change of position by the use of at least two parts of the body; one part so to speak squeezes, the other is squeezed; for the part that is still is squeezed as it has to carry the weight, the part that is lifted strains against that which carries the weight. It follows then that nothing without parts can move itself in this way, for it has not in it the distinction of the part which is passive and that which is active.

4

Again, the boundaries by which living beings are naturally determined are six in number, superior and inferior, before and behind, right and left. Of these all living beings have a superior and an inferior part; for superior and inferior is in plants too, not only in animals. And this distinction is one of function, not

merely of position relatively to our earth and the sky above our heads. The superior is that from which flows in each kind the distribution of nutriment and the process of growth; the inferior is that to which the process flows and in which it ends. One is a starting-point, the other an end, and the starting-point is the superior. And yet it might be thought that in the case of plants at least the inferior is rather the appropriate starting-point, for in them the superior and inferior are in position other than in animals. Still they are similarly situated from the point of view of function, though not in their position relatively to the universe. The roots are the superior part of a plant, for from them the nutriment is distributed to the growing members, and a plant takes it with its roots as an animal does with its mouth.

Things that are not only alive but are animals have both a front and a back, because they all have sense, and front and back are distinguished by reference to sense. The front is the part in which sense is innate, and whence each thing gets its sensations, the opposite parts are the back.

All animals which partake not only in sense, but are able of themselves to make a change of place, have a further distinction of left and right besides those already enumerated; like the former these are distinctions of function and not of position. The right is that from which change of position naturally begins, the opposite which naturally depends upon this is the left.

This distinction (of right and left) is more articulate and detailed in some than in others. For animals which make the aforesaid change (of place) by the help of organized parts (I mean feet for example, or wings or similar organs) have the left and right distinguished in greater detail, while those which are not differentiated into such parts, but make the differentiation in the body itself and so progress, like some footless animals (for

example snakes and caterpillars after their kind, and besides what men call earth-worms), all these have the distinction spoken of, although it is not made so manifest to us. That the beginning of movement is on the right is indicated by the fact that all men carry burdens on the left shoulder; in this way they set free the side which initiates movement and enable the side which bears the weight to be moved. And so men hop easier on the left leg; for the nature of the right is to initiate movement, that of the left to be moved. The burden then must rest on the side which is to be moved, not on that which is going to cause movement, and if it be set on the moving side, which is the original of movement, it will either not be moved at all or with more labour. Another indication that the right is the source of movement is the way we put our feet forward; all men lead off with the left, and after standing still prefer to put the left foot forward, unless something happens to prevent it. The reason is that their movement comes from the leg they step off, not from the one put forward. Again, men guard themselves with their right. And this is the reason why the right is the same in all, for that from which motion begins is the same for all, and has its natural position in the same place, and for this reason the spiral-shaped Testaceans have their shells on the right, for they do not move in the direction of the spire, but all go forward in the direction opposite to the spire. Examples are the murex and the ceryx. As all animals then start movement from the right, and the right moves in the same direction as the whole, it is necessary for all to be alike right-handed. And man has the left limbs detached more than any other animal because he is natural in a higher degree than the other animals; now the right is naturally both better than the left and separate from it, and so in man the right is more especially the right, more dextrous that is, than in other animals. The right then being differentiated it is only reasonable that in man the left should be most movable, and most detached. In man, too, the other

starting-points are found most naturally and clearly distinct, the superior part that is and the front.

5

Animals which, like men and birds, have the superior part distinguished from the front are two-footed (biped). In them, of the four points of motion, two are wings in the one, hands and arms in the other. Animals which have the superior and the front parts identically situated are four-footed, many-footed, or footless (quadruped, polypod, limbless). I use the term foot for a member employed for movement in place connected with a point on the ground, for the feet appear to have got their name from the ground under our feet.

Some animals, too, have the front and back parts identically situated, for example, Cephalopods (molluscs) and spiral-shaped Testaceans, and these we have discussed elsewhere in another connexion.

Now there is in place a superior, an intermediate, and an inferior; in respect to place bipeds have their superior part corresponding to the part of the universe; quadrupeds, polypods, and footless animals to the intermediate part, and plants to the inferior. The reason is that these have no power of locomotion, and the superior part is determined relatively to the nutriment, and their nutriment is from the earth. Quadrupeds, polypods, and footless animals again have their superior part corresponding to the intermediate, because they are not erect. Bipeds have theirs corresponding to the superior part of the universe because they are erect, and of bipeds, man par excellence; for man is the most natural of bipeds. And it is reasonable for the starting points to be in these parts; for the

starting-point is honourable, and the superior is more honourable than the inferior, the front than the back, and the right than the left. Or we may reverse the argument and say quite well that these parts are more honourable than their opposites just because the starting-points are in them.

6

The above discussion has made it clear that the original of movement is in the parts on the right. Now every continuous whole, one part of which is moved while the other remains at rest must, in order to be able to move as a whole while one part stands still, have in the place where both parts have opposed movements some common part which connects the moving parts with one another. Further in this common part the original of the motion (and similarly of the absence of motion) of each of the parts must lie.

Clearly then if any of the opposite pairs of parts (right and left, that is, superior and inferior, before and behind) have a movement of their own, each of them has for common original of its movements the juncture of the parts in question.

Now before and behind are not distinctions relatively to that which sets up its own motion, because in nature nothing has a movement backwards, nor has a moving animal any division whereby it may make a change of position towards its front or back; but right and left, superior and inferior are so distinguished. Accordingly, all animals which progress by the use of distinct members have these members distinguished not by the differences of before and behind, but only of the remaining two pairs; the prior difference dividing these members into right and left (a difference which must appear as

soon as you have division into two), and the other difference appearing of necessity where there is division into four.

Since then these two pairs, the superior and inferior and the right and left, are linked to one another by the same common original (by which I mean that which controls their movement), and further, everything which is intended to make a movement in each such part properly must have the original cause of all the said movements arranged in a certain definite position relatively to the distances from it of the originals of the movements of the individual members (and these centres of the individual parts are in pairs arranged coordinately or diagonally, and the common centre is the original from which the animal's movements of right and left, and similarly of superior and inferior, start); each animal must have this original at a point where it is equally or nearly equally related to each of the centres in the four parts described.

7

It is clear then how locomotion belongs to those animals only which make their changes of place by means of two or four points in their structure, or to such animals par excellence. Moreover, since this property belongs almost peculiarly to Sanguineous animals, we see that no Sanguineous animal can progress at more points than four, and that if it is the nature of anything so to progress at four points it must of necessity be Sanguineous.

What we observe in the animal world is in agreement with the above account. For no Sanguineous animal if it be divided into more parts can live for any appreciable length of time, nor can it enjoy the power of locomotion which it possessed while it was a

continuous and undivided whole. But some bloodless animals and polypods can live a long time, if divided, in each of the severed parts, and can move in the same way as before they were dismembered. Examples are what is termed the centipede and other insects that are long in shape, for even the hinder portion of all these goes on progressing in the same direction as before when they are cut in two.

The explanation of their living when thus divided is that each of them is constructed like a continuous body of many separate living beings. It is plain, too, from what was said above why they are like this. Animals constructed most naturally are made to move at two or four points, and even limbless Sanguinea are no exception. They too move by dint of four points, whereby they achieve progression. They go forward by means of two flexions. For in each of their flexions there is a right and a left, both before and behind in their flat surface, in the part towards the head a right and a left front point, and in the part towards the tail the two hinder points. They look as if they moved at two points only, where they touch before and behind, but that is only because they are narrow in breadth. Even. in them the right is the sovereign part, and there is an alternate correspondence behind, exactly as in quadrupeds. The reason of their flexions is their great length, for just as tall men walk with their spines bellied (undulated) forward, and when their right shoulder is leading in a forward direction their left hip rather inclined backwards, so that their middle becomes hollow and bellied (undulated), so we ought to conceive snakes as moving in concave curves (undulations) upon the ground. And this is evidence that they move themselves like the quadrupeds, for they make the concave in its turn convex and the convex concave. When in its turn the left of the forward parts is leading, the concavity is in its turn reversed, for the right becomes the inner. (Let the right front point be A, the left B, the right hind C, the left D.)

Among land animals this is the character of the movement of snakes, and among water animals of eels, and conger-eels and also lampreys, in fact of all that have their form snakelike. However, some marine animals of this shape have no fin, lampreys for example, but put the sea to the same use as snakes do both land and water (for snakes swim precisely as they move on the ground). Others have two fins only, for example conger-eels and eels and a kind of cestreus which breeds in the lake of Siphae. On this account too those that are accustomed to live on land, for example all the eels, move with fewer flexions in a fluid than on land, while the kind of cestreus which has two fins, by its flexion in a fluid makes up the remaining points.

8

The reason why snakes are limbless is first that nature makes nothing without purpose, but always regards what is the best possible for each individual, preserving the peculiar essence of each and its intended character, and secondly the principle we laid down above that no Sanguineous creature can move itself at more than four points. Granting this it is evident that Sanguineous animals like snakes, whose length is out of proportion to the rest of their dimensions, cannot possibly have limbs; for they cannot have more than four (or they would be bloodless), and if they had two or four they would be practically stationary; so slow and unprofitable would their movement necessarily be.

But every limbed animal has necessarily an even number of such limbs. For those which only jump and so move from place to place do not need limbs for this movement at least, but those

which not only jump but also need to walk, finding that movement not sufficient for their purposes, evidently either are better able to progress with even limbs or cannot otherwise progress at all every animal which has limbs must have an even us for as this kind of movement is effected by part of the body at a time, and not by the whole at once as in the movement of leaping, some of the limbs must in turn remain at rest, and others be moved, and the animal must act in each of these cases with opposite limbs, shifting the weight from the limbs that are being moved to those at rest. And so nothing can walk on three limbs or on one; in the latter case it has no support at all on which to rest the body's weight, in the former only in respect of one pair of opposites, and so it must necessarily fall in endeavouring so to move.

Polypods however, like the Centipede, can indeed make progress on an odd number of limbs, as may be seen by the experiment of wounding one of their limbs; for then the mutilation of one row of limbs is corrected by the number of limbs which remain on either side. Such mutilated creatures, however, drag the wounded limb after them with the remainder, and do not properly speaking walk. Moreover, it is plain that they, too, would make the change of place better if they had an even number, in fact if none were missing and they had the limbs which correspond to one another. In this way they could equalize their own weight, and not oscillate to one side, if they had corresponding supports instead of one section of the opposite sides being unoccupied by a limb. A walking creature advances from each of its members alternately, for in this way it recovers the same figure that it had at first.

9

The fact that all animals have an even number of feet, and the reasons for the fact have been set forth. What follows will explain that if there were no point at rest flexion and straightening would be impossible. Flexion is a change from a right line to an arc or an angle, straightening a change from either of these to a right line. Now in all such changes the flexion or the straightening must be relative to one point. Moreover, without flexion there could not be walking or swimming or flying. For since limbed creatures stand and take their weight alternately on one or other of the opposite legs, if one be thrust forward the other of necessity must be bent. For the opposite limbs are naturally of equal length, and the one which is under the weight must be a kind of perpendicular at right angles to the ground.

When then one leg is advanced it becomes the hypotenuse of a right-angled triangle. Its square then is equal to the square on the other side together with the square on the base. As the legs then are equal, the one at rest must bend either at the knee or, if there were any kneeless animal which walked, at some other articulation. The following experiment exhibits the fact. If a man were to walk parallel to a wall in sunshine, the line described (by the shadow of his head> would be not straight but zigzag, becoming lower as he bends, and higher when he stands and lifts himself up.

It is, indeed, possible to move oneself even if the leg be not bent, in the way in which children crawl. This was the old though erroneous account of the movement of elephants. But these kinds of movements involve a flexion in the shoulders or in the hips. Nothing at any rate could walk upright continuously and securely without flexions at the knee, but would have to move like men in the wrestling schools who crawl forward through

the sand on their knees. For the upper part of the upright creature is long so that its leg has to be correspondingly long; in consequence there must be flexion. For since a stationary position is perpendicular, if that which moves cannot bend it will either fall forward as the right angle becomes acute or will not be able to progress. For if one leg is at right angles to the ground and the other is advanced, the latter will be at once equal and greater. For it will be equal to the stationary leg and also equivalent to the hypotenuse of a right-angled triangle. That which goes forward therefore must bend, and while bending one, extend the other leg simultaneously, so as to incline forward and make a stride and still remain above the perpendicular; for the legs form an isosceles triangle, and the head sinks lower when it is perpendicularly above the base on which it stands.

Of limbless animals, some progress by undulations (and this happens in two ways, either they undulate on the ground, like snakes, or up and down, like caterpillars), and undulation is a flexion; others by a telescopic action, like what are called earthworms and leeches. These go forward, first one part leading and then drawing the whole of the rest of the body up to this, and so they change from place to place. It is plain too that if the two curves were not greater than the one line which subtends them undulating animals could not move themselves; when the flexure is extended they would not have moved forward at all if the flexure or arc were equal to the chord subtended; as it is, it reaches further when it is straightened out, and then this part stays still and it draws up what is left behind.

In all the changes described that which moves now extends itself in a straight line to progress, and now is hooped; it straightens itself in its leading part, and is hooped in what follows behind. Even jumping animals all make a flexion in the

part of the body which is underneath, and after this fashion make their leaps. So too flying and swimming things progress, the one straightening and bending their wings to fly, the other their fins to swim. Of the latter some have four fins, others which are rather long, for example eels, have only two. These swim by substituting a flexion of the rest of their body for the (missing) pair of fins to complete the movement, as we have said before. Flat fish use two fins, and the flat of their body as a substitute for the absent pair of fins. Quite flat fish, like the Ray, produce their swimming movement with the actual fins and with the two extremes or semicircles of their body, bending and straightening themselves alternately.

10

A difficulty might perhaps be raised about birds. How, it may be said, can they, either when they fly or when they walk, be said to move at four points? Now we did not say that all Sanguinea move at four points, but merely at not more than four. Moreover, they cannot as a fact fly if their legs be removed, nor walk without their wings. Even a man does not walk without moving his shoulders. Everything indeed, as we have said, makes a change of place by flexion and straightening, for all things progress by pressing upon what being beneath them up to a point gives way as it were gradually; accordingly, even if there be no flexion in another member, there must be at least in the point whence motion begins, is in feathered (flying) insects at the base of the 'scale-wing', in birds at the base of the wing, in others at the base of the corresponding member, the fins, for instance, in fish. In others, for example snakes, the flexion begins in the joints of the body.

In winged creatures the tail serves, like a ship's rudder, to keep the flying thing in its course. The tail then must like other limbs be able to bend at the point of attachment. And so flying insects, and birds (Schizoptera) whose tails are ill-adapted for the use in question, for example peacocks, and domestic cocks, and generally birds that hardly fly, cannot steer a straight course. Flying insects have absolutely no tail, and so drift along like a rudderless vessel, and beat against anything they happen upon; and this applies equally to sharded insects, like the scarab-beetle and the chafer, and to unsharded, like bees and wasps. Further, birds that are not made for flight have a tail that is of no use; for instance the purple coot and the heron and all water-fowl. These fly stretching out their feet as a substitute for a tail, and use their legs instead of a tail to direct their flight. The flight of insects is slow and frail because the character of their feathery wings is not proportionate to the bulk of their body; this is heavy, their wings small and frail, and so the flight they use is like a cargo boat attempting to make its voyage with oars; now the frailty both of the actual wings and of the outgrowths upon them contributes in a measure to the flight described. Among birds, the peacock's tail is at one time useless because of its size, at another because it is shed. But birds are in general at the opposite pole to flying insects as regards their feathers, but especially the swiftest flyers among them. (These are the birds with curved talons, for swiftness of wing is useful to their mode of life.) The rest of their bodily structure is in harmony with their peculiar movement, the small head, the slight neck, the strong and acute breastbone (acute like the prow of a clipper-built vessel, so as to be well-girt, and strong by dint of its mass of flesh), in order to be able to push away the air that beats against it, and that easily and without exhaustion. The hind-quarters, too, are light and taper again, in order to conform to the movement of the front and not by their breadth to suck the air.

11

So much then for these questions. But why an animal that is to stand erect must necessarily be not only a biped, but must also have the superior parts of the body lighter, and those that lie under these heavier, is plain. Only if situated like this could it possibly carry itself easily. And so man, the only erect animal, has legs longer and stouter relatively to the upper parts of his body than any other animal with legs. What we observe in children also is evidence of this. Children cannot walk erect because they are always dwarf-like, the upper parts of their bodies being longer and stouter than the lower. With advancing years the lower increase disproportionately, until the children get their appropriate size, and then and not till then they succeed in walking erect. Birds are hunchbacked yet stand on two legs because their weight is set back, after the principle of horses fashioned in bronze with their forelegs prancing. But their being bipeds and able to stand is above all due to their having the hip-bone shaped like a thigh, and so large that it looks as if they had two thighs, one in the leg before the knee-joint, the other joining his part to the fundament. Really this is not a thigh but a hip, and if it were not so large the bird could not be a biped. As in a man or a quadruped, the thigh and the rest of the leg would be attached immediately to quite a small hip; consequently the whole body would be tilted forward. As it is, however, the hip is long and extends right along to the middle of the belly, so that the legs are attached at that point and carry as supports the whole frame. It is also evident from these considerations that a bird cannot possibly be erect in the sense in which man is. For as it holds its body now the wings are naturally useful to it, but if it were erect they would be as

useless as the wings of Cupids we see in pictures. It must have been clear as soon as we spoke that the form of no human nor any similar being permits of wings; not only because it would, though Sanguineous, be moved at more than four points, but also because to have wings would be useless to it when moving naturally. And Nature makes nothing contrary to her own nature.

12

We have stated above that without flexion in the legs or shoulders and hips no Sanguineous animal with feet could progress, and that flexion is impossible except some point be at rest, and that men and birds, both bipeds, bend their legs in opposite directions, and further that quadrupeds bend their in opposite directions, and each pair in the opposite way to a man's limbs. For men bend their arms backwards, their legs forwards; quadrupeds their forelegs forwards, their back legs backwards, and in like manner also birds bend theirs. The reason is that Nature's workmanship is never purposeless, as we said above, but everything for the best possible in the circumstances. Inasmuch, therefore, as all creatures which naturally have the power of changing position by the use of limbs, must have one leg stationary with the weight of the body on it, and when they move forward the leg which has the leading position must be unencumbered, and the progression continuing the weight must shift and be taken off on this leading leg, it is evidently necessary for the back leg from being bent to become straight again, while the point of movement of the leg thrust forward and its lower part remain still. And so the legs must be jointed. And it is possible for this to take place and at the same time for the animal to go forward, if the leading leg

has its articulation forwards, impossible if it be backwards. For, if it be forwards, the stretching out of the leg will be while the body is going forwards, but, if the other way, while it is going backwards. And again, if the flexion were backwards, the placing of the foot would be made by two movements and those contrary to one another, one, that is, backwards and one forwards; for in the bending together of the limb the lower end of the thigh would go backwards, and the shin would move the foot forwards away from the flexion; whereas, with the flexion forwards, the progression described will be performed not with contrary motions, but with one forward motion.

Now man, being a biped and making his change of position in the natural way with his two legs, bends them forward for the reasons set forth, but his arms bend backwards reasonably enough. If they bent the opposite way they would be useless for the work of the hands, and for taking food. But quadrupeds which are also viviparous necessarily bend their front legs forwards. For these lead off first when they move, and are also in the forepart of their body. The reason that they bend forward is the same as in the case of man, for in this respect they are like mankind. And so quadrupeds as well as men bend these legs forward in the manner described. Moreover, if the flexion is like this, they are enabled to lift their feet high; if they bent them in the opposite way they would only lift them a little way from the ground, because the whole thigh and the joint from which the shin-bone springs would lie under the belly as the beast moved forward. If, however, the flexion of the hind legs were forwards the lifting of these feet would be similar to that of the forefeet (for the hind legs, too, would in this case have only a little room for their lifting inasmuch as both the thigh and the knee-joint would fall under the position of the belly); but the flexion being backwards, as in fact it is, nothing comes in the way of their progression with this mode of moving the feet. Moreover, it is necessary or at least better for their legs to

bend thus when they are suckling their young, with a view to such ministrations. If the flexion were inwards it would be difficult to keep their young under them and to shelter them.

13

Now there are four modes of flexion if we take the combinations in pairs. Fore and hind may bend either both backwards, as the figures marked A, or in the opposite way both forwards, as in B, or in converse ways and not in the same direction, as in C where the fore bend forwards and the hind bend backwards, or as in D, the opposite way to C, where the convexities are turned towards one another and the concavities outwards. Now no biped or quadruped bends his limbs like the figures A or B, but the quadrupeds like C, and like D only the elephant among quadrupeds and man if you consider his arms as well as his legs. For he bends his arms concavely and his legs convexly.

In man, too, the flexions of the limbs are always alternately opposite, for example the elbow bends back, but the wrist of the hand forwards, and again the shoulder forwards. In like fashion, too, in the case of the legs, the hip backwards, the knee forwards, the ankle in the opposite way backwards. And plainly the lower limbs are opposed in this respect to the upper, because the first joints are opposites, the shoulder bending forwards, the hip backwards; wherefore also the ankle bends backwards, and the wrist of the hand forwards.

14

This is the way then the limbs bend, and for the reasons given. But the hind limbs move criss-cross with the fore limbs; after the off fore they move the near hind, then the near fore, and then the off hind. The reason is that (a) if they moved the forelegs together and first, the animal would be wrenched, and the progression would be a stumbling forwards with the hind parts as it were dragged after. Again, that would not be walking but jumping, and it is hard to make a continuous change of place, jumping all the time. Here is evidence of what I say; even as it is, all horses that move in this way soon begin to refuse, for example the horses in a religious procession. For these reasons the fore limbs and the hind limbs move in this separate way. Again, (b) if they moved both the right legs first the weight would be outside the supporting limbs and they would fall. If then it is necessary to move in one or other of these ways or criss-cross fashion, and neither of these two is satisfactory, they must move criss-cross; for moving in the way we have said they cannot possibly experience either of these untoward results. And this is why horses and such-like animals stand still with their legs put forward criss-cross, not with the right or the left put forward together at once. In the same fashion animals with more than four legs make their movements; if you take two consecutive pairs of legs the hind move criss-cross with the forelegs; you can see this if you watch them moving slowly. Even crabs move in this way, and they are polypods. They, too, always move criss-cross in whichever direction they are making progress. For in direction this animal has a movement all its own; it is the only animal that moves not forwards, but obliquely. Yet since forwards is a distinction relative to the line of vision, Nature has made its eyes able to conform to its limbs, for its eyes can move themselves obliquely, and therefore after a fashion crabs are no exception but in this sense move forwards.

15

Birds bend their legs in the same way as quadrupeds. For their natural construction is broadly speaking nearly the same. That is, in birds the wings are a substitute for the forelegs; and so they are bent in the same way as the forelegs of a quadruped, since when they move to progress the natural beginning of change is from the wings (as in quadrupeds from the forelegs). Flight in fact is their appropriate movement. And so if the wings be cut off a bird can neither stand still nor go forwards.

Again, the bird though a biped is not erect, and has the forward parts of the body lighter than the hind, and so it is necessary (or at least preferable for the standing posture) to have the thigh so placed below the body as it actually is, I mean growing towards the back. If then it must have this situation the flexion of the leg must be backwards, as in the hind legs of quadrupeds. The reasons are the same as those given in the case of viviparous quadrupeds.

If now we survey generally birds and winged insects, and animals which swim in a watery medium, all I mean that make their progress in water by dint of organs of movement, it is not difficult to see that it is better to have the attachment of the parts in question oblique to the frame, exactly as in fact we see it to be both in birds and insects. And this same arrangement obtains also among fishes. Among birds the wings are attached obliquely; so are the fins in water animals, and the feather-like wings of insects. In this way they divide the air or water most quickly and with most force and so effect their movement. For the hinder parts in this way would follow forwards as they are

carried along in the yielding medium, fish in the water, birds in the air.

Of oviparous quadrupeds all those that live in holes, like crocodiles, lizards, spotted lizards, freshwater tortoises, and turtles, have their legs attached obliquely as their whole body sprawls over the ground, and bend them obliquely. The reason is that this is useful for ease in creeping into holes, and for sitting upon their eggs and guarding them. And as they are splayed outwards they must of necessity tuck in their thighs and put them under them in order to achieve the lifting of the whole body. In view of this they cannot bend them otherwise than outwards.

16

We have already stated the fact that non-sanguineous animals with limbs are polypods and none of them quadrupeds. And the reason why their legs, except the extreme pairs, were necessarily attached obliquely and had their flexions upwards, and the legs themselves were somewhat turned under (bandy-shape) and backwards is plain. In all such creatures the intermediate legs both lead and follow. If then they lay under them, they must have had their flexion both forwards and backwards; on account of leading, forwards; and on account of following, backwards. Now since they have to do both, for this reason their limbs are turned under and bent obliquely, except the two extreme pairs. (These two are more natural in their movement, the front leading and the back following.) Another reason for this kind of flexion is the number of their legs; arranged in this way they would interfere less with one another in progression and not knock together. But the reason that they

are bandy is that all of them or most of them live in holes, for creatures living so cannot possibly be high above the ground.

But crabs are in nature the oddest of all polypods; they do not progress forwards except in the sense explained above, they are the only animals which have more than one pair of leading limbs. The explanation of this is the hardness of their limbs, and the fact that they use them not for swimming but for walking; they always keep on the ground. However, the flexion of the limbs of all polypods is oblique, like that of the quadrupeds which live in holes – for example lizards and crocodiles and most of the oviparous quadrupeds. And the explanation is that some of them in their breeding periods, and some all their life, live in holes.

17

Now the rest have bandy legs because they are soft-skinned, but the crayfish is hard-skinned and its limbs are for swimming and not for walking (and so are not bandy). Crabs, too, have their limbs bent obliquely, but not bandy like oviparous quadrupeds and non-sanguineous polypods, because their limbs have a hard and shell-like skin, although they don't swim but live in holes; they live in fact on the ground. Moreover, their shape is like a disk, as compared with the crayfish which is elongated, and they haven't a tail like the crayfish; a tail is useful to the crayfish for swimming, but the crab is not a swimming creature. Further, it alone has its side equivalent to a hinder part, because it has many leading feet. The explanation of this is that its flexions are not forward nor its legs turned in under (bandy). We have given above the reason why its legs are not turned in

under, that is the hardness and shell-like character of its integument.

For these reasons then it must lead off with more than one limb, and move obliquely; obliquely, because the flexion is oblique; and with more than one limb, because otherwise the limbs that were still would have got in the way of those that were moving.

Fishes of the flat kind swim with their heads twisted, as one-eyed men walk; they have their natural shape distorted. Web-footed birds swim with their feet; because they breath the air and have lungs they are bipeds, but because they have their home in the water they are webbed; by this arrangement their feet serve them instead of fins. They have their legs too, not like the rest of birds in the centre of their body, but rather set back. Their legs are short, and being set back are serviceable for swimming. The reason for their having short legs is that nature has added to their feet by subtracting from the length of their limbs; instead of length she gives stoutness to the legs and breadth to the feet. Broad feet are more useful than long for pushing away the water when they are swimming.

18

There is reason, too, for winged creatures having feet, but fish none. The former have their home in the dry medium, and cannot remain always in mid air; they must therefore have feet. Fish on the contrary live in the wet medium, and take in water, not air. Fins are useful for swimming, but feet not. And if they had both they would be non-sanguineous. There is a broad similarity between birds and fishes in the organs of locomotion. Birds have their wings on the superior part, similarly fish have

two pectoral fins; again, birds have legs on their under parts and near the wings; similarly, most fish have two fins on the under parts and near the pectorals. Birds, too, have a tail and fish a tail-fin.

19

A difficulty may be suggested as to the movements of molluscs, that is, as to where that movement originates; for they have no distinction of left and right. Now observation shows them moving. We must, I think, treat all this class as mutilated, and as moving in the way in which limbed creatures do when one cuts off their legs, or as analogous with the seal and the bat. Both the latter are quadrupeds but misshapen. Now molluscs do move, but move in a manner contrary to nature. They are not moving things, but are moving if as sedentary creatures they are compared with zoophytes, and sedentary if classed with progressing animals.

As to right and left, crabs, too, show the distinction poorly, still they do show it. You can see it in the claw; the right claw is larger and stronger, as though the right and left sides were trying to get distinguished.

The structure of animals, both in their other parts, and especially in those which concern progression and any movement in place, is as we have now described. It remains, after determining these questions, to investigate the problems of Life and Death.

Aristotle - On the Generation of Animals

[Translated by Arthur Platt]

Book I

1

We have now discussed the other parts of animals, both generally and with reference to the peculiarities of each kind, explaining how each part exists on account of such a cause, and I mean by this the final cause.

There are four causes underlying everything: first, the final cause, that for the sake of which a thing exists; secondly, the formal cause, the definition of its essence (and these two we may regard pretty much as one and the same); thirdly, the material; and fourthly, the moving principle or efficient cause.

We have then already discussed the other three causes, for the definition and the final cause are the same, and the material of animals is their parts of the whole animal the non-homogeneous parts, of these again the homogeneous, and of these last the so-called elements of all matter. It remains to speak of those parts which contribute to the generation of animals and of which nothing definite has yet been said, and to explain what is the moving or efficient cause. To inquire into this last and to inquire into the generation of each animal is in a way the same thing; and, therefore, my plan has united them together, arranging the discussion of these parts last, and the beginning of the question of generation next to them.

Now some animals come into being from the union of male and female, i.e. all those kinds of animal which possess the two sexes. This is not the case with all of them; though in the sanguinea with few exceptions the creature, when its growth is complete, is either male or female, and though some bloodless animals have sexes so that they generate offspring of the same kind, yet other bloodless animals generate indeed, but not offspring of the same kind; such are all that come into being not from a union of the sexes, but from decaying earth and excrements. To speak generally, if we take all animals which change their locality, some by swimming, others by flying, others by walking, we find in these the two sexes, not only in the sanguinea but also in some of the bloodless animals; and this applies in the case of the latter sometimes to the whole class, as the cephalopoda and crustacea, but in the class of insects only to the majority. Of these, all which are produced by union of animals of the same kind generate also after their kind, but all which are not produced by animals, but from decaying matter, generate indeed, but produce another kind, and the offspring is neither male nor female; such are some of the insects. This is what might have been expected, for if those animals which are not produced by parents had themselves united and produced others, then their offspring must have been either like or unlike to themselves. If like, then their parents ought to have come into being in the same way; this is only a reasonable postulate to make, for it is plainly the case with other animals. If unlike, and yet able to copulate, then there would have come into being again from them another kind of creature and again another from these, and this would have gone on to infinity. But Nature flies from the infinite, for the infinite is unending or imperfect, and Nature ever seeks an end.

But all those creatures which do not move, as the testacea and animals that live by clinging to something else, inasmuch as

their nature resembles that of plants, have no sex any more than plants have, but as applied to them the word is only used in virtue of a similarity and analogy. For there is a slight distinction of this sort, since even in plants we find in the same kind some trees which bear fruit and others which, while bearing none themselves, yet contribute to the ripening of the fruits of those which do, as in the case of the fig-tree and caprifig.

The same holds good also in plants, some coming into being from seed and others, as it were, by the spontaneous action of Nature, arising either from decomposition of the earth or of some parts in other plants, for some are not formed by themselves separately but are produced upon other trees, as the mistletoe. Plants, however, must be investigated separately.

2

Of the generation of animals we must speak as various questions arise in order in the case of each, and we must connect our account with what has been said. For, as we said above, the male and female principles may be put down first and foremost as origins of generation, the former as containing the efficient cause of generation, the latter the material of it. The most conclusive proof of this is drawn from considering how and whence comes the semen; for there is no doubt that it is out of this that those creatures are formed which are produced in the ordinary course of Nature; but we must observe carefully the way in which this semen actually comes into being from the male and female. For it is just because the semen is secreted from the two sexes, the secretion taking place in them and from them, that they are first principles of generation. For

by a male animal we mean that which generates in another, and by a female that which generates in itself; wherefore men apply these terms to the macrocosm also, naming Earth mother as being female, but addressing Heaven and the Sun and other like entities as fathers, as causing generation.

Male and female differ in their essence by each having a separate ability or faculty, and anatomically by certain parts; essentially the male is that which is able to generate in another, as said above; the female is that which is able to generate in itself and out of which comes into being the offspring previously existing in the parent. And since they are differentiated by an ability or faculty and by their function, and since instruments or organs are needed for all functioning, and since the bodily parts are the instruments or organs to serve the faculties, it follows that certain parts must exist for union of parents and production of offspring. And these must differ from each other, so that consequently the male will differ from the female. (For even though we speak of the animal as a whole as male or female, yet really it is not male or female in virtue of the whole of itself, but only in virtue of a certain faculty and a certain part – just as with the part used for sight or locomotion – which part is also plain to sense-perception.)

Now as a matter of fact such parts are in the female the so-called uterus, in the male the testes and the penis, in all the sanguinea; for some of them have testes and others the corresponding passages. There are corresponding differences of male and female in all the bloodless animals also which have this division into opposite sexes. But if in the sanguinea it is the parts concerned in copulation that differ primarily in their forms, we must observe that a small change in a first principle is often attended by changes in other things depending on it. This is plain in the case of castrated animals, for, though only the generative part is disabled, yet pretty well the whole form of

the animal changes in consequence so much that it seems to be female or not far short of it, and thus it is clear than an animal is not male or female in virtue of an isolated part or an isolated faculty. Clearly, then, the distinction of sex is a first principle; at any rate, when that which distinguishes male and female suffers change, many other changes accompany it, as would be the case if a first principle is changed.

3

The sanguinea are not all alike as regards testes and uterus. Taking the former first, we find that some of them have not testes at all, as the classes of fish and of serpents, but only two spermatic ducts. Others have testes indeed, but internally by the loin in the region of the kidneys, and from each of these a duct, as in the case of those animals which have no testes at all, these ducts unite also as with those animals; this applies (among animals breathing air and having a lung) to all birds and oviparous quadrupeds. For all these have their testes internal near the loin, and two ducts from these in the same way as serpents; I mean the lizards and tortoises and all the scaly reptiles. But all the vivipara have their testes in front; some of them inside at the end of the abdomen, as the dolphin, not with ducts but with a penis projecting externally from them; others outside, either pendent as in man or towards the fundament as in swine. They have been discriminated more accurately in the Enquiries about Animals.

The uterus is always double, just as the testes are always two in the male. It is situated either near the pudendum (as in women, and all those animals which bring forth alive not only externally but also internally, and all fish that lay eggs externally) or up

towards the hypozoma (as in all birds and in viviparous fishes). The uterus is also double in the crustacea and the cephalopoda, for the membranes which include their so-called eggs are of the nature of a uterus. It is particularly hard to distinguish in the case of the poulps, so that it seems to be single, but the reason of this is that the bulk of the body is everywhere similar.

It is double also in the larger insects; in the smaller the question is uncertain owing to the small size of the body.

Such is the description of the aforesaid parts of animals.

4

With regard to the difference of the spermatic organs in males, if we are to investigate the causes of their existence, we must first grasp the final cause of the testes. Now if Nature makes everything either because it is necessary or because it is better so, this part also must be for one of these two reasons. But that it is not necessary for generation is plain; else had it been possessed by all creatures that generate, but as it is neither serpents have testes nor have fish; for they have been seen uniting and with their ducts full of milt. It remains then that it must be because it is somehow better so. Now it is true that the business of most animals is, you may say, nothing else than to produce young, as the business of a plant is to produce seed and fruit. But still as, in the case of nutriment, animals with straight intestines are more violent in their desire for food, so those which have not testes but only ducts, or which have them indeed but internally, are all quicker in accomplishing copulation. But those which are to be more temperate in the one case have not straight intestines, and in the other have their ducts twisted to prevent their desire being too violent and

hasty. It is for this that the testes are contrived; for they make the movement of the spermatic secretion steadier, preserving the folding back of the passages in the vivipara, as horses and the like, and in man. (For details see the Enquiries about Animals.) For the testes are no part of the ducts but are only attached to them, as women fasten stones to the loom when weaving; if they are removed the ducts are drawn up internally, so that castrated animals are unable to generate; if they were not drawn up they would be able, and before now a bull mounting immediately after castration has caused conception in the cow because the ducts had not yet been drawn up. In birds and oviparous quadrupeds the testes receive the spermatic secretion, so that its expulsion is slower than in fishes. This is clear in the case of birds, for their testes are much enlarged at the time of copulation, and all those which pair at one season of the year have them so small when this is past that they are almost indiscernible, but during the season they are very large. When the testes are internal the act of copulation is quicker than when they are external, for even in the latter case the semen is not emitted before the testes are drawn up.

5

Besides, quadrupeds have the organ of copulation, since it is possible for them to have it, but for birds and the footless animals it is not possible, because the former have their legs under the middle of the abdomen and the latter have no legs at all; now the penis depends from that region and is situated there. (Wherefore also the legs are strained in intercourse, both the penis and the legs being sinewy.) So that, since it is not possible for them to have this organ, they must necessarily either have no testes also, or at any rate not have them there, as

those animals that have both penis and testes have them in the same situation.

Further, with those animals at any rate that have external testes, the semen is collected together before emission, and emission is due to the penis being heated by its movement; it is not ready for emission at immediate contact as in fishes.

All the vivipira have their testes in front, internally or externally, except the hedgehog; he alone has them near the loin. This is for the same reason as with birds, because their union must be quick, for the hedgehog does not, like the other quadrupeds, mount upon the back of the female, but they conjugate standing upright because of their spines.

So much for the reasons why those animals have testes which have them, and why they are sometimes external and sometimes internal.

6

All those animals which have no testes are deficient in this part, as has been said, not because it is better to be so but simply because of necessity, and secondly because it is necessary that their copulation should be speedy. Such is the nature of fish and serpents. Fish copulate throwing themselves alongside of the females and separating again quickly. For as men and all such creatures must hold their breath before emitting the semen, so fish at such times must cease taking in the sea-water, and then they perish easily. Therefore they must not mature the semen during copulation, as viviparous land-animals do, but they have it all matured together before the time, so as not to be maturing it while in contact but to emit it ready matured. So they have no

testes, and the ducts are straight and simple. There is a small part similar to this connected with the testes in the system of quadrupeds, for part of the reflected duct is sanguineous and part is not; the fluid is already semen when it is received by and passes through this latter part, so that once it has arrived there it is soon emitted in these quadrupeds also. Now in fishes the whole passage resembles the last section of the reflected part of the duct in man and similar animals.

7

Serpents copulate twining round one another, and, as said above, have neither testes nor penis, the latter because they have no legs, the former because of their length, but they have ducts like for on account of their extreme length the seminal fluid would take too long in its passage and be cooled if it were further delayed by testes. (This happens also if the penis is large; such men are less fertile than when it is smaller because the semen, if cold, is not generative, and that which is carried too far is cooled.) So much for the reason why some animals have testes and others not. Serpents intertwine because of their inaptitude to cast themselves alongside of one another. For they are too long to unite closely with so small a part and have no organs of attachment, so they make use of the suppleness of their bodies, intertwining. Wherefore also they seem to be slower in copulation than fish, not only on account of the length of the ducts but also of this elaborate arrangement in uniting.

8

It is not easy to state the facts about the uterus in female animals, for there are many points of difference. The vivipara are not alike in this part; women and all the vivipara with feet have the uterus low down by the pudendum, but the cartilaginous viviparous fish have it higher up near the hypozoma. In the ovipara, again, it is low in fish (as in women and the viviparous quadrupeds), high in birds and all oviparous quadrupeds. Yet even these differences are on a principle. To begin with the ovipara, they differ in the manner of laying their eggs, for some produce them imperfect, as fishes whose eggs increase and are finally developed outside of them. The reason is that they produce many young, and this is their function as it is with plants. If then they perfected the egg in themselves they must needs be few in number, but as it is, they have so many that each uterus seems to be an egg, at any rate in the small fishes. For these are the most productive, just as with the other animals and plants whose nature is analogous to theirs, for the increase of size turns with them to seed.

But the eggs of birds and the quadrupedal ovipara are perfect when produced. In order that these may be preserved they must have a hard covering (for their envelope is soft so long as they are increasing in size), and the shell is made by heat squeezing out the moisture for the earthy material; consequently the place must be hot in which this is to happen. But the part about the hypozoma is hot, as is shown by that being the part which concocts the food. If then the eggs must be within the uterus, then the uterus must be near the hypozoma in those creatures which produce their eggs in a perfect form. Similarly it must be low down in those which produce them imperfect, for it is profitable that it should be so. And it is more natural for the uterus to be low down than high up, when Nature has no other business in hand to hinder it; for its end is low down, and where

is the end, there is the function, and the uterus itself is naturally where the function is.

9

We find differences in the vivipara also as compared with one another. Some produce their young alive, not only externally, but also internally, as men, horses, dogs, and all those which have hair, and among aquatic animals, dolphins, whales, and such cetacea.

10

But the cartilaginous fish and the vipers produce their young alive externally, but first produce eggs internally. The egg is perfect, for so only can an animal be generated from an egg, and nothing comes from an imperfect one. It is because they are of a cold nature, not hot as some assert, that they do not lay their eggs externally.

11

At least they certainly produce their eggs in a soft envelope, the reason being that they have but little heat and so their nature does not complete the process of drying the egg-shell. Because, then, they are cold they produce soft-shelled eggs, and because

the eggs are soft they do not produce them externally; for that would have caused their destruction.

The process is for the most part the same as in birds, for the egg descends and the young is hatched from it near the vagina, where the young is produced in those animals which are viviparous from the beginning. Therefore in such animals the uterus is dissimilar to that of both the vivipara and ovipara, because they participate in both classes; for it is at once near the hypozoma and also stretching along downwards in all the cartilaginous fishes. But the facts about this and the other kinds of uterus must be gathered from inspection of the drawings of dissections and from the Enquiries. Thus, because they are oviparous, laying perfect eggs, they have the uterus placed high, but, as being viviparous, low, participating in both classes.

Animals that are viviparous from the beginning all have it low, Nature here having no other business to interfere with her, and their production having no double character. Besides this, it is impossible for animals to be produced alive near the hypozoma, for the foetus must needs be heavy and move, and that region in the mother is vital and would not be able to bear the weight and the movement. Thirdly, parturition would be difficult because of the length of the passage to be traversed; even as it is there is difficulty with women if they draw up the uterus in parturition by yawning or anything of the kind, and even when empty it causes a feeling of suffocation if moved upwards. For if a uterus is to hold a living animal it must be stronger than in ovipara, and therefore in all the vivipara it is fleshy, whereas when the uterus is near the hypozoma it is membranous. And this is clear also in the case of the animals which produce young by the mixed method, for their eggs are high up and sideways, but the living young are produced in the lower part of the uterus.

So much for the reason why differences are found in the uterus of various animals, and generally why it is low in some and high in others near the hypozoma.

12

Why is the uterus always internal, but the testes sometimes internal, sometimes external? The reason for the uterus always being internal is that in this is contained the egg or foetus, which needs guarding, shelter, and maturation by concoction, while the outer surface of the body is easily injured and cold. The testes vary in position because they also need shelter and a covering to preserve them and to mature the semen; for it would be impossible for them, if chilled and stiffened, to be drawn up and discharge it. Therefore, whenever the testes are visible, they have a cuticular covering known as the scrotum. If the nature of the skin is opposed to this, being too hard to be adapted for enclosing them or for being soft like a true 'skin', as with the scaly integument of fish and reptiles, then the testes must needs be internal. Therefore they are so in dolphins and all the cetacea which have them, and in the oviparous quadrupeds among the scaly animals. The skin of birds also is hard so that it will not conform to the size of anything and enclose it neatly. (This is another reason with all these animals for their testes being internal besides those previously mentioned as arising necessarily from the details of copulation.) For the same reason they are internal in the elephant and hedgehog, for the skin of these, too, is not well suited to keep the protective part separate.

[The position of the uterus differs in animals viviparous within themselves and those externally oviparous, and in the latter

class again it differs in those which have the uterus low and those which have it near the hypozoma, as in fishes compared with birds and oviparous quadrupeds. And it is different again in those which produce young in both ways, being oviparous internally and viviparous externally. For those which are viviparous both internally and externally have the uterus placed on the abdomen, as men, cattle, dogs, and the like, since it is expedient for the safety and growth of the foetus that no weight should be upon the uterus.]

13

The passages also are different through which the solid and liquid excreta pass out in all the vivipara. Wherefore both males and females in this class all have a part whereby the urine is voided, and this serves also for the issue of the semen in males, of the offspring in females. This passage is situated above and in front of the passage of the solid excreta. The passage is the same as that of the solid nutriment in all those animals that have no penis, in all the ovipara, even those of them that have a bladder, as the tortoises. For it is for the sake of generation, not for the evacuation of the urine, that the passages are double; but because the semen is naturally liquid, the liquid excretion also shares the same passage. This is clear from the fact that all animals produce semen, but all do not void liquid excrement. Now the spermatic passages of the male must be fixed and must not wander, and the same applies to the uterus of the female, and this fixing must take place at either the front or the back of the body. To take the uterus first, it is in the front of the body in vivipara because of the foetus, but at the loin and the back in ovipara. All animals which are internally oviparous and externally viviparous are in an intermediate condition because

they participate in both classes, being at once oviparous and viviparous. For the upper part of the uterus, where the eggs are produced, is under the hypozoma by the loin and the back, but as it advances is low at the abdomen; for it is in that part that the animal is viviparous. In these also the passage for solid excrement and for copulation is the same, for none of these, as has been said already, has a separate pudendum.

The same applies to the passages in the male, whether they have testes or no, as to the uterus of the ovipara. For in all of them, not only in the ovipara, the ducts adhere to the back and the region of the spine. For they must not wander but be settled, and that is the character of the region of the back, which gives continuity and stability. Now in those which have internal testes, the ducts are fixed from the first, and they are fixed in like manner if the testes are external; then they meet together towards the region of the penis.

The like applies to the ducts in the dolphins, but they have their testes hidden under the abdominal cavity.

We have now discussed the situation of the parts contributing to generation, and the causes thereof.

14

The bloodless animals do not agree either with the sanguinea or with each other in the fashion of the parts contributing to generation. There are four classes still left to deal with, first the crustacea, secondly the cephalopoda, thirdly the insects, and fourthly the testacea. We cannot be certain about all of them, but that most of them copulate is plain; in what manner they unite must be stated later.

The crustacea copulate like the retromingent quadrupeds, fitting their tails to one another, the one supine and the other prone. For the flaps attached to the sides of the tail being long prevent them from uniting with the belly against the back. The males have fine spermatic ducts, the females a membranous uterus alongside the intestine, cloven on each side, in which the egg is produced.

15

The cephalopoda entwine together at the mouth, pushing against one another and enfolding their arms. This attitude is necessary, because Nature has bent backwards the end of the intestine and brought it round near the mouth, as has been said before in the treatise on the parts of animals. The female has a part corresponding to the uterus, plainly to be seen in each of these animals, for it contains an egg which is at first indivisible to the eye but afterwards splits up into many; each of these eggs is imperfect when deposited, as with the oviparous fishes. In the cephalopoda (as also in the crustacea) the same passage serves to void the excrement and leads to the part like a uterus, for the male discharges the seminal fluid through this passage. And it is on the lower surface of the body, where the mantle is open and the sea-water enters the cavity. Hence the union of the male with the female takes place at this point, for it is necessary, if the male discharges either semen or a part of himself or any other force, that he should unite with her at the uterine passage. But the insertion, in the case of the poulps, of the arm of the male into the funnel of the female, by which arm the fishermen say the male copulates with her, is only for the sake of attachment, and it is not an organ useful for generation,

for it is outside the passage in the male and indeed outside the body of the male altogether.

Sometimes also cephalopoda unite by the male mounting on the back of the female, but whether for generation or some other cause has not yet been observed.

16

Some insects copulate and the offspring are produced from animals of the same name, just as with the sanguinea; such are the locusts, cicadae, spiders, wasps, and ants. Others unite indeed and generate; but the result is not a creature of the same kind, but only a scolex, and these insects do not come into being from animals but from putrefying matter, liquid or solid; such are fleas, flies, and cantharides. Others again are neither produced from animals nor unite with each other; such are gnats, 'conopes', and many similar kinds. In most of those which unite the female is larger than the male. The males do not appear to have spermatic passages. In most cases the male does not insert any part into the female, but the female from below upwards into the male; this has been observed in many cases (as also that the male mounts the female), the opposite in few cases; but observations are not yet comprehensive enough to enable us to make a distinction of classes. And generally it is the rule with most of the oviparous fish and oviparous quadrupeds that the female is larger than the because this is expedient in view of the increase of bulk in conception by reason of the eggs. In the female the part analogous to the uterus is cleft and extends along the intestine, as with the other animals; in this are produced the results of conception. This is

clear in locusts and all other large insects whose nature it is to unite; most insects are too small to be observed in this respect.

Such is the character of the generative organs in animals which were not spoken of before. It remains now to speak of the homogeneous parts concerned, the seminal fluid and milk. We will take the former first, and treat of milk afterwards.

17

Some animals manifestly emit semen, as all the sanguinea, but whether the insects and cephalopoda do so is uncertain. Therefore this is a question to be considered, whether all males do so, or not all; and if not all, why some do and some not; and whether the female also contributes any semen or not; and, if not semen, whether she does not contribute anything else either, or whether she contributes something else which is not semen. We must also inquire what those animals which emit semen contribute by means of it to generation, and generally what is the nature of semen, and of the so-called catamenia in all animals which discharge this liquid.

Now it is thought that all animals are generated out of semen, and that the semen comes from the parents. Wherefore it is part of the same inquiry to ask whether both male and female produce it or only one of them, and to ask whether it comes from the whole of the body or not from the whole; for if the latter is true it is reasonable to suppose that it does not come from both parents either. Accordingly, since some say that it comes from the whole of the body, we must investigate this question first.

The proofs from which it can be argued that the semen comes from each and every part of the body may be reduced to four. First, the intensity of the pleasure of coition; for the same state of feeling is more pleasant if multiplied, and that which affects all the parts is multiplied as compared with that which affects only one or a few. Secondly, the alleged fact that mutilations are inherited, for they argue that since the parent is deficient in this part the semen does not come from thence, and the result is that the corresponding part is not formed in the offspring. Thirdly, the resemblances to the parents, for the young are born like them part for part as well as in the whole body; if then the coming of the semen from the whole body is cause of the resemblance of the whole, so the parts would be like because it comes from each of the parts. Fourthly, it would seem to be reasonable to say that as there is some first thing from which the whole arises, so it is also with each of the parts, and therefore if semen or seed is cause of the whole so each of the parts would have a seed peculiar to itself. And these opinions are plausibly supported by such evidence as that children are born with a likeness to their parents, not in congenital but also in acquired characteristics; for before now, when the parents have had scars, the children have been born with a mark in the form of the scar in the same place, and there was a case at Chalcedon where the father had a brand on his arm and the letter was marked on the child, only confused and not clearly articulated. That is pretty much the evidence on which some believe that the semen comes from all the body.

18

On examining the question, however, the opposite appears more likely, for it is not hard to refute the above arguments and

the view involves impossibilities. First, then, the resemblance of children to parents is no proof that the semen comes from the whole body, because the resemblance is found also in voice, nails, hair, and way of moving, from which nothing comes. And men generate before they yet have certain characters, such as a beard or grey hair. Further, children are like their more remote ancestors from whom nothing has come, for the resemblances recur at an interval of many generations, as in the case of the woman in Elis who had intercourse with the Aethiop; her daughter was not an Aethiop but the son of that daughter was. The same thing applies also to plants, for it is clear that if this theory were true the seed would come from all parts of plants also; but often a plant does not possess one part, and another part may be removed, and a third grows afterwards. Besides, the seed does not come from the pericarp, and yet this also comes into being with the same form as in the parent plant.

We may also ask whether the semen comes from each of the homogeneous parts only, such as flesh and bone and sinew, or also from the heterogeneous, such as face and hands. For if from the former only, we object that resemblance exists rather in the heterogeneous parts, such as face and hands and feet; if then it is not because of the semen coming from all parts that children resemble their parents in these, what is there to stop the homogeneous parts also from being like for some other reason than this? If the semen comes from the heterogeneous alone, then it does not come from all parts; but it is more fitting that it should come from the homogeneous parts, for they are prior to the heterogeneous which are composed of them; and as children are born like their parents in face and hands, so they are, necessarily, in flesh and nails. If the semen comes from both, what would be the manner of generation? For the heteroeneous parts are composed of the homogneous, so that to come from the former would be to come from the latter and from their composition. To make this clearer by an illustration,

take a written name; if anything came from the whole of it, it would be from each of the syllables, and if from these, from the letters and their composition. So that if really flesh and bones are composed of fire and the like elements, the semen would come rather from the elements than anything else, for how can it come from their composition? Yet without this composition there would be no resemblance. If again something creates this composition later, it would be this that would be the cause of the resemblance, not the coming of the semen from every part of the body.

Further, if the parts of the future animal are separated in the semen, how do they live? and if they are connected, they would form a small animal.

And what about the generative parts? For that which comes from the male is not similar to what comes from the female.

Again, if the semen comes from all parts of both parents alike, the result is two animals, for the offspring will have all the parts of both. Wherefore Empedocles seems to say what agrees pretty well with this view (if we are to adopt it), to a certain extent at any rate, but to be wrong if we think otherwise. What he says agrees with it when he declares that there is a sort of tally in the male and female, and that the whole offspring does not come from either, 'but sundered is the fashion of limbs, some in man's...' For why does not the female generate from herself if the semen comes from all parts alike and she has a receptacle ready in the uterus? But, it seems, either it does not come from all the parts, or if it does it is in the way Empedocles says, not the same parts coming from each parent, which is why they need intercourse with each other.

Yet this also is impossible, just as much as it is impossible for the parts when full grown to survive and have life in them when torn apart, as Empedocles accounts for the creation of

animals; in the time of his 'Reign of Love', says he, 'many heads sprang up without necks,' and later on these isolated parts combined into animals. Now that this is impossible is plain, for neither would the separate parts be able to survive without having any soul or life in them, nor if they were living things, so to say, could several of them combine so as to become one animal again. Yet those who say that semen comes from the whole of the body really have to talk in that way, and as it happened then in the earth during the 'Reign of Love', so it happens according to them in the body. Now it is impossible that the parts should be united together when they come into being and should come from different parts of the parent, meeting together in one place. Then how can the upper and lower, right and left, front and back parts have been 'sundered'? All these points are unintelligible. Further, some parts are distinguished by possessing a faculty, others by being in certain states or conditions; the heterogeneous, as tongue and hand, by the faculty of doing something, the homogeneous by hardness and softness and the other similar states. Blood, then, will not be blood, nor flesh flesh, in any and every state. It is clear, then, that that which comes from any part, as blood from blood or flesh from flesh, will not be identical with that part. But if it is something different from which the blood of the offspring comes, the coming of the semen from all the parts will not be the cause of the resemblance, as is held by the supporters of this theory. For if blood is formed from something which is not blood, it is enough that the semen come from one part only, for why should not all the other parts of the offspring as well as blood be formed from one part of the parent? Indeed, this theory seems to be the same as that of Anaxagoras, that none of the homogeneous parts come into being, except that these theorists assume, in the case of the generation of animals, what he assumed of the universe.

Then, again, how will these parts that came from all the body of the parent be increased or grow? It is true that Anaxagoras plausibly says that particles of flesh out of the food are added to the flesh. But if we do not say this (while saying that semen comes from all parts of the body), how will the foetus become greater by the addition of something else if that which is added remain unchanged? But if that which is added can change, then why not say that the semen from the very first is of such a kind that blood and flesh can be made out of it, instead of saying that it itself is blood and flesh? Nor is there any other alternative, for surely we cannot say that it is increased later by a process of mixing, as wine when water is poured into it. For in that case each element of the mixture would be itself at first while still unmixed, but the fact rather is that flesh and bone and each of the other parts is such later. And to say that some part of the semen is sinew and bone is quite above us, as the saying is.

Besides all this there is a difficulty if the sex is determined in conception (as Empedocles says: 'it is shed in clean vessels; some wax female, if they fall in with cold'). Anyhow, it is plain that both men and women change not only from infertile to fertile, but also from bearing female to bearing male offspring, which looks as if the cause does not lie in the semen coming from all the parent or not, but in the mutual proportion or disproportion of that comes from the woman and the man, or in something of this kind. It is clear, then, if we are to put this down as being so, that the female sex is not determined by the semen coming from any particular part, and consequently neither is the special sexual part so determined (if really the same semen can become either male or female child, which shows that the sexual part does not exist in the semen). Why, then, should we assert this of this part any more than of others? For if semen does not come from this part, the uterus, the same account may be given of the others.

Again, some creatures come into being neither from parents of the same kind nor from parents of a different kind, as flies and the various kinds of what are called fleas; from these are produced animals indeed, but not in this case of similar nature but a kind of scolex. It is plain in this case that the young of a different kind are not produced by semen coming from all parts of the parent, for they would then resemble them, if indeed resemblance is a sign of its coming from all parts.

Further even among animals some produce many young from a single coition (and something like this is universal among plants, for it is plain that they bear all the fruit of a whole season from a single movement). And yet how would this be possible if the semen were secreted from all the body? For from a single coition and a single segregation of the semen scattered throughout the body must needs follow only a single secretion. Nor is it possible for it to be separated in the uterus, for this would no longer be a mere separation of semen, but, as it were, a severance from a new plant or animal.

Again, the cuttings from a plant bear seed; clearly, therefore, even before they were cut from the parent plant, they bore their fruit from their own mass alone, and the seed did not come from all the plant.

But the greatest proof of all is derived from observations we have sufficiently established on insects. For, if not in all, at least in most of these, the female in the act of copulation inserts a part of herself into the male. This, as we said before, is the way they copulate, for the females manifestly insert this from below into the males above, not in all cases, but in most of those observed. Hence it seems clear that, when the males do emit semen, then also the cause of the generation is not its coming from all the body, but something else which must be investigated hereafter. For even if it were true that it comes

from all the body, as they say, they ought not to claim that it comes from all parts of it, but only from the creative part – from the workman, so to say, not the material he works in. Instead of that, they talk as if one were to say that the semen comes from the shoes, for, generally speaking, if a son is like his father, the shoes he wears are like his father's shoes.

As to the vehemence of pleasure in sexual intercourse, it is not because the semen comes from all the body, but because there is a strong friction (wherefore if this intercourse is often repeated the pleasure is diminished in the persons concerned). Moreover, the pleasure is at the end of the act, but it ought, on the theory, to be in each of the parts, and not at the same time, but sooner in some and later in others.

If mutilated young are born of mutilated parents, it is for the same reason as that for which they are like them. And the young of mutilated parents are not always mutilated, just as they are not always like their parents; the cause of this must be inquired into later, for this problem is the same as that.

Again, if the female does not produce semen, it is reasonable to suppose it does not come from all the body of the male either. Conversely, if it does not come from all the male it is not unreasonable to suppose that it does not come from the female, but that the female is cause of the generation in some other way. Into this we must next inquire, since it is plain that the semen is not secreted from all the parts.

In this investigation and those which follow from it, the first thing to do is to understand what semen is, for then it will be easier to inquire into its operations and the phenomena connected with it. Now the object of semen is to be of such a nature that from it as their origin come into being those things which are naturally formed, not because there is any agent which makes them from it as simply because this is the semen.

Now we speak of one thing coming from another in many senses; it is one thing when we say that night comes from day or a man becomes man from boy, meaning that A follows B; it is another if we say that a statue is made from bronze and a bed from wood, and so on in all the other cases where we say that the thing made is made from a material, meaning that the whole is formed from something preexisting which is only put into shape. In a third sense a man becomes unmusical from being musical, sick from being well, and generally in this sense contraries arise from contraries. Fourthly, as in the 'climax' of Epicharmus; thus from slander comes railing and from this fighting, and all these are from something in the sense that it is the efficient cause. In this last class sometimes the efficient cause is in the things themselves, as in the last mentioned (for the slander is a part of the whole trouble), and sometimes external, as the art is external to the work of art or the torch to the burning house. Now the offspring comes from the semen, and it is plainly in one of the two following senses that it does so – either the semen is the material from which it is made, or it is the first efficient cause. For assuredly it is not in the sense of A being after B, as the voyage comes from, i.e. after, the Panathenaea; nor yet as contraries come from contraries, for then one of the two contraries ceases to be, and a third substance must exist as an immediate underlying basis from which the new thing comes into being. We must discover then, in which of the two other classes the semen is to be put, whether it is to be regarded as matter, and therefore acted upon by something else, or as a form, and therefore acting upon something else, or as both at once. For perhaps at the same time we shall see clearly also how all the products of semen come into being from contraries, since coming into being from contraries is also a natural process, for some animals do so, i.e. from male and female, others from only one parent, as is the case with plants and all those animals in which male and

female are not separately differentiated. Now that which comes from the generating parent is called the seminal fluid, being that which first has in it a principle of generation, in the case of all animals whose nature it is to unite; semen is that which has in it the principles from both united parents, as the first mixture which arises from the union of male and female, be it a foetus or an ovum, for these already have in them that which comes from both. (Semen, or seed, and grain differ only in the one being earlier and the other later, grain in that it comes from something else, i.e. the seed, and seed in that something else, the grain, comes from it, for both are really the same thing.)

We must again take up the question what the primary nature of what is called semen is. Needs must everything which we find in the body either be (1) one of the natural parts, whether homogeneous or heterogeneous, or (2) an unnatural part such as a growth, or (3) a secretion or excretion, or (4) waste-product, or (5) nutriment. (By secretion or excretion I mean the residue of the nutriment, by waste-product that which is given off from the tissues by an unnatural decomposition.)

Now that semen cannot be a part of the body is plain, for it is homogeneous, and from the homogeneous nothing is composed, e.g. from only sinew or only flesh; nor is it separated as are all the other parts. But neither is it contrary to Nature nor a defect, for it exists in all alike, and the development of the young animal comes from it. Nutriment, again, is obviously introduced from without.

It remains, then, that it must be either a waste-product or a secretion or excretion. Now the ancients seem to think that it is a waste-product, for when they say that it comes from all the body by reason of the heat of the movement of the body in copulation, they imply that it is a kind of waste-product. But

these are contrary to Nature, and from such arises nothing according to Nature. So then it must be a secretion or excretion.

But, to go further into it, every secretion or excretion is either of useless or useful nutriment; by ‘useless’ I mean that from which nothing further is contributed to natural growth, but which is particularly mischievous to the body if too much of it is consumed; by ‘useful’ I mean the opposite. Now it is evident that it cannot be of the former character, for such is most abundant in persons of the worst condition of body through age or sickness; semen, on the contrary, is least abundant in them for either they have none at all or it is not fertile, because a useless and morbid secretion is mingled with it.

Semen, then, is part of a useful secretion. But the most useful is the last and that from which finally is formed each of the parts of the body. For secretions are either earlier or later; of the nutriment in the first stage the secretion is phlegm and the like, for phlegm also is a secretion of the useful nutriment, an indication of this being that if it is mixed with pure nutriment it is nourishing, and that it is used up in cases of illness. The final secretion is the smallest in proportion to the quantity of nutriment. But we must reflect that the daily nutriment by which animals and plants grow is but small, for if a very little be added continually to the same thing the size of it will become excessive.

So we must say the opposite of what the ancients said. For whereas they said that semen is that which comes from all the body, we shall say it is that whose nature is to go to all of it, and what they thought a waste-product seems rather to be a secretion. For it is more reasonable to suppose that the last extract of the nutriment which goes to all parts resembles that which is left over from it, just as part of a painter’s colour is often left over resembling that which he has used up. Waste-

products, on the contrary, are always due to corruption or decay and to a departure from Nature.

A further proof that it is not a waste-product, but rather a secretion, is the fact that the large animals have few young, the small many. For the large must have more waste and less secretion, since the great size of the body causes most of the nutriment to be used up, so that the residue or secretion is small.

Again, no place has been set apart by Nature for waste-products but they flow wherever they can find an easy passage in the body, but a place has been set apart for all the natural secretions; thus the lower intestine serves for the excretion of the solid nutriment, the bladder for that of the liquid; for the useful part of the nutriment we have the upper intestine, for the spermatic secretions the uterus and pudenda and breasts, for it is collected and flows together into them.

And the resulting phenomena are evidence that semen is what we have said, and these result because such is the nature of the secretion. For the exhaustion consequent on the loss of even a very little of the semen is conspicuous because the body is deprived of the ultimate gain drawn from the nutriment. With some few persons, it is true, during a short time in the flower of their youth the loss of it, if it be excessive in quantity, is an alleviation (just as in the case of the nutriment in its first stage, if too much have been taken, since getting rid of this also makes the body more comfortable), and so it may be also when other secretions come away with it, for in that case it is not only semen that is lost but also other influences come away mingled with it, and these are morbid. Wherefore, with some men at least, that which comes from them proves sometimes incapable of procreation because the seminal element in it is so small. But still in most men and as a general rule the result of intercourse

is exhaustion and weakness rather than relief, for the reason given. Moreover, semen does not exist in them either in childhood or in old age or in sickness – in the last case because of weakness, in old age because they do not sufficiently concoct their food, and in childhood because they are growing and so all the nutriment is used up too soon, for in about five years, in the case of human beings at any rate, the body seems to gain half the height that is gained in all the rest of life.

In many animals and plants we find a difference in this connexion not only between kinds as compared with kinds, but also between similar individuals of the same kind as compared with each other, e.g. man with man or vine with vine. Some have much semen, others little, others again none at all, not through weakness but the contrary, at any rate in some cases. This is because the nutriment is used up to form the body, as with some human beings, who, being in good condition and developing much flesh or getting rather too fat, produce less semen and are less desirous of intercourse. Like this is what happens with those vines which 'play the goat', that is, luxuriate wantonly through too much nutrition, for he-goats when fat are less inclined to mount the female; for which reason they thin them before breeding from them, and say that the vines 'play the goat', so calling it from the condition of the goats. And fat people, women as well as men, appear to be less fertile than others from the fact that the secretion when in process of concoction turns to fat with those who are too well-nourished. For fat also is a healthy secretion due to good living.

In some cases no semen is produced at all, as by the willow and poplar. This condition is due to each of the two causes, weakness and strength; the former prevents concoction of the nutriment, the latter causes it to be all consumed, as said above. In like manner other animals produce much semen through weakness as well as through strength, when a great quantity of

a useless secretion is mixed with it; this sometimes results in actual disease when a passage is not found to carry off the impurity, and though some recover of this, others actually die of it. For corrupt humours collect here as in the urine, which also has been known to cause disease.

[Further the same passage serves for urine and semen; and whatever animals have both kinds of excrement, that of liquid and that of solid nutriment, discharge the semen by the same passage as the liquid excrement (for it is a secretion of a liquid, since the nutriment of all animals is rather liquid than solid), but those which have no liquid excrement discharge it at the passage of the solid residua. Moreover, waste-products are always morbid, but the removal of the secretion is useful; now the discharge of the semen participates in both characteristics because it takes up some of the non-useful nutriment. But if it were a waste-product it would be always harmful; as it is, it is not so.]

From what has been said, it is clear that semen is a secretion of useful nutriment, and that in its last stage, whether it is produced by all or no.

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After this we must distinguish of what sort of nutriment it is a secretion, and must discuss the catamenia which occur in certain of the vivipara. For thus we shall make it clear (1) whether the female also produces semen like the male and the foetus is a single mixture of two semens, or whether no semen is secreted by the female, and, (2) if not, whether she contributes nothing else either to generation but only provides a

receptacle, or whether she does contribute something, and, if so, how and in what manner she does so.

We have previously stated that the final nutriment is the blood in the sanguinea and the analogous fluid in the other animals. Since the semen is also a secretion of the nutriment, and that in its final stage, it follows that it will be either (1) blood or that which is analogous to blood, or (2) something formed from this. But since it is from the blood, when concocted and somehow divided up, that each part of the body is made, and since the semen if properly concocted is quite of a different character from the blood when it is separated from it, but if not properly concocted has been known in some cases to issue in a bloody condition if one forces oneself too often to coition, therefore it is plain that semen will be a secretion of the nutriment when reduced to blood, being that which is finally distributed to the parts of the body. And this is the reason why it has so great power, for the loss of the pure and healthy blood is an exhausting thing; for this reason also it is natural that the offspring should resemble the parents, for that which goes to all the parts of the body resembles that which is left over. So that the semen which is to form the hand or the face or the whole animal is already the hand or face or whole animal undifferentiated, and what each of them is actually such is the semen potentially, either in virtue of its own mass or because it has a certain power in itself. I mention these alternatives here because we have not yet made it clear from the distinctions drawn hitherto whether it is the matter of the semen that is the cause of generation, or whether it has in it some faculty and efficient cause thereof, for the hand also or any other bodily part is not hand or other part in a true sense if it be without soul or some other power, but is only called by the same name as the living hand.

On this subject, then, so much may be laid down. But since it is necessary (1) that the weaker animal also should have a secretion greater in quantity and less concocted, and (2) that being of such a nature it should be a mass of sanguineous liquid, and (3) since that which Nature endows with a smaller portion of heat is weaker, and (4) since it has already been stated that such is the character of the female – putting all these considerations together we see that the sanguineous matter discharged by the female is also a secretion. And such is the discharge of the so-called catamenia.

It is plain, then, that the catamenia are a secretion, and that they are analogous in females to the semen in males. The circumstances connected with them are evidence that this view is correct. For the semen begins to appear in males and to be emitted at the same time of life that the catamenia begin to flow in females, and that they change their voice and their breasts begin to develop. So, too, in the decline of life the generative power fails in the one sex and the catamenia in the other.

The following signs also indicate that this discharge in females is a secretion. Generally speaking women suffer neither from haemorrhoids nor bleeding at the nose nor anything else of the sort except when the catamenia are ceasing, and if anything of the kind occurs the flow is interfered with because the discharge is diverted to it.

Further, the blood-vessels of women stand out less than those of men, and women are rounder and smoother because the secretion which in men goes to these vessels is drained away with the catamenia. We must suppose, too, that the same cause accounts for the fact that the bulk of the body is smaller in females than in males among the vivipara, since this is the only class in which the catamenia are discharged from the body. And

in this class the fact is clearest in women, for the discharge is greater in women than in the other animals. Wherefore her pallor and the absence of prominent blood-vessels is most conspicuous, and the deficient development of her body compared with a man's is obvious.

Now since this is what corresponds in the female to the semen in the male, and since it is not possible that two such discharges should be found together, it is plain that the female does not contribute semen to the generation of the offspring. For if she had semen she would not have the catamenia; but, as it is, because she has the latter she has not the former.

It has been stated then that the catamenia are a secretion as the semen is, and confirmation of this view may be drawn from some of the phenomena of animals. For fat creatures produce less semen than lean ones, as observed before. The reason is that fat also, like semen, is a secretion, is in fact concocted blood, only not concocted in the same way as the semen. Thus, if the secretion is consumed to form fat the semen is naturally deficient. And so among the bloodless animals the cephalopoda and crustacea are in best condition about the time of producing eggs, for, because they are bloodless and no fat is formed in them, that which is analogous in them to fat is at that season drawn off to form the spermatic secretion.

And a proof that the female does not emit similar semen to the male, and that the offspring is not formed by a mixture of both, as some say, is that often the female conceives without the sensation of pleasure in intercourse, and if again the pleasure is experience by her no less than by the male and the two sexes reach their goal together, yet often no conception takes place unless the liquid of the so-called catamenia is present in a right proportion. Hence the female does not produce young if the catamenia are absent altogether, nor often when, they being

present, the efflux still continues; but she does so after the purgation. For in the one case she has not the nutriment or material from which the foetus can be framed by the power coming from the male and inherent in the semen, and in the other it is washed away with the catamenia because of their abundance. But when after their occurrence the greater part has been evacuated, the remainder is formed into a foetus. Cases of conception when the catamenia do not occur at all, or of conception during their discharge instead of after it, are due to the fact that in the former instance there is only so much liquid to begin with as remains behind after the discharge in fertile women, and no greater quantity is secreted so as to come away from the body, while in the latter instance the mouth of the uterus closes after the discharge. When, therefore, the quantity already expelled from the body is great but the discharge still continues, only not on such a scale as to wash away the semen, then it is that conception accompanies coition. Nor is it at all strange that the catamenia should still continue after conception (for even after it they recur to some extent, but are scanty and do not last during all the period of gestation; this, however, is a morbid phenomenon, wherefore it is found only in a few cases and then seldom, whereas it is that which happens as a regular thing that is according to Nature).

It is clear then that the female contributes the material for generation, and that this is in the substance of the catamenia, and that they are a secretion.

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Some think that the female contributes semen in coition because the pleasure she experiences is sometimes similar to

that of the male, and also is attended by a liquid discharge. But this discharge is not seminal; it is merely proper to the part concerned in each case, for there is a discharge from the uterus which occurs in some women but not in others. It is found in those who are fair-skinned and of a feminine type generally, but not in those who are dark and of a masculine appearance. The amount of this discharge, when it occurs, is sometimes on a different scale from the emission of semen and far exceeds it. Moreover, different kinds of food cause a great difference in the quantity of such discharges; for instance some pungently-flavoured foods cause them to be conspicuously increased. And as to the pleasure which accompanies coition it is due to emission not only of semen, but also of a spiritus, the coming together of which precedes the emission. This is plain in the case of boys who are not yet able to emit semen, but are near the proper age, and of men who are impotent, for all these are capable of pleasure by attrition. And those who have been injured in the generative organs sometimes suffer from diarrhoea because the secretion, which they are not able to concoct and turn into semen, is diverted into the intestine. Now a boy is like a woman in form, and the woman is as it were an impotent male, for it is through a certain incapacity that the female is female, being incapable of concocting the nutriment in its last stage into semen (and this is either blood or that which is analogous to it in animals which are bloodless owing to the coldness of their nature). As then diarrhoea is caused in the bowels by the insufficient concoction of the blood, so are caused in the blood-vessels all discharges of blood, including that of the catamenia, for this also is such a discharge, only it is natural whereas the others are morbid.

Thus it is clear that it is reasonable to suppose that generation comes from this. For the catamenia are semen not in a pure state but in need of working up, as in the formation of fruits the nutriment is present, when it is not yet sifted thoroughly, but

needs working up to purify it. Thus the catamenia cause generation mixture with the semen, as this impure nutriment in plants is nutritious when mixed with pure nutriment.

And a sign that the female does not emit semen is the fact that the pleasure of intercourse is caused by touch in the same region of the female as of the male; and yet is it not from thence that this flow proceeds. Further, it is not all females that have it at all, but only the sanguinea, and not all even of these, but only those whose uterus is not near the hypozoma and which do not lay eggs; it is not found in the animals which have no blood but only the analogous fluid (for what is blood in the former is represented by another fluid in the latter). The reason why neither the latter nor those sanguinea mentioned (i.e. those whose uterus is low and which do not lay eggs) have this effluxion is the dryness of their bodies; this allows but little matter to be secreted, only enough for generation but not enough to be discharged from the body. All animals that are viviparous without producing eggs first (such are man and all quadrupeds which bend their hind-legs outwards, for all these are viviparous without producing eggs) – all these have the catamenia, unless they are defective in development as the mule, only the efflux is not abundant as in women. Details of the facts in each animal have been given in the Enquiries concerning animals.

The catamenia are more abundant in women than in the other animals, and men emit the most semen in proportion to their size. The reason is that the composition of their bodies is liquid and hot compared to others, for more matter must be secreted in such a case. Further, man has no such parts in his body as those to which the superfluous matter is diverted in the other animals; for he has no great quantity of hair in proportion to his body, nor outgrowths of bones, horns, and teeth.

There is evidence that the semen is in the catamenia, for, as said before, this secretion appears in the male at the same time of life as the catamenia in the female; this indicates that the parts destined to receive each of these secretions are differentiated at the same time in both sexes; and as the neighboring parts in both become swollen the hair of puberty springs forth in both alike. As the parts in question are on the point of differentiating they are distended by the spiritus; this is clearer in males in the testes, but appears also about the breasts; in females it is more marked in the breasts, for it is when they have risen two fingers' breadth that the catamenia generally begin.

Now, in all living things in which the male and female are not separated the semen (or seed) is a sort of embryo; by embryo I mean the first mixture of male and female; hence, from one semen comes one bodys – for example, one stalk of wheat from one grain, as one animal from one egg (for twin eggs are really two eggs). But in whatever kinds the sexes are distinguished, in these many animals may come from one emission of semen, showing that the semen differs in its nature in plants and animals. A proof of this is that animals which can bear more than one young one at a time do so in consequence of only one coition. Whereby, too, it is plain that the semen does not come from the whole of the body; for neither would the different parts of the semen already be separated as soon as discharged from the same part, nor could they be separated in the uterus if they had once entered it all together; but what does happen is just what one would expect, since what the male contributes to generation is the form and the efficient cause, while the female contributes the material. In fact, as in the coagulation of milk, the milk being the material, the fig-juice or rennet is that which contains the curdling principle, so acts the secretion of the male, being divided into parts in the female. Why it is sometimes divided into more or fewer parts, and sometimes not

divided at all, will be the subject of another discussion. But because it does not differ in kind at any rate this does not matter, but what does matter is only that each part should correspond to the material, being neither too little to concoct it and fix it into form, nor too much so as to dry it up; it then generates a number of offspring. But from this first formative semen, if it remains one, and is not divided, only one young one comes into being.

That, then, the female does not contribute semen to generation, but does contribute something, and that this is the matter of the catamenia, or that which is analogous to it in bloodless animals, is clear from what has been said, and also from a general and abstract survey of the question. For there must needs be that which generates and that from which it generates; even if these be one, still they must be distinct in form and their essence must be different; and in those animals that have these powers separate in two sexes the body and nature of the active and the passive sex must also differ. If, then, the male stands for the effective and active, and the female, considered as female, for the passive, it follows that what the female would contribute to the semen of the male would not be semen but material for the semen to work upon. This is just what we find to be the case, for the catamenia have in their nature an affinity to the primitive matter.

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So much for the discussion of this question. At the same time the answer to the next question we have to investigate is clear from these considerations, I mean how it is that the male contributes to generation and how it is that the semen from the

male is the cause of the offspring. Does it exist in the body of the embryo as a part of it from the first, mingling with the material which comes from the female? Or does the semen communicate nothing to the material body of the embryo but only to the power and movement in it? For this power is that which acts and makes, while that which is made and receives the form is the residue of the secretion in the female. Now the latter alternative appears to be the right one both a priori and in view of the facts. For, if we consider the question on general grounds, we find that, whenever one thing is made from two of which one is active and the other passive, the active agent does not exist in that which is made; and, still more generally, the same applies when one thing moves and another is moved; the moving thing does not exist in that which is moved. But the female, as female, is passive, and the male, as male, is active, and the principle of the movement comes from him. Therefore, if we take the highest genera under which they each fall, the one being active and motive and the other passive and moved, that one thing which is produced comes from them only in the sense in which a bed comes into being from the carpenter and the wood, or in which a ball comes into being from the wax and the form. It is plain then that it is not necessary that anything at all should come away from the male, and if anything does come away it does not follow that this gives rise to the embryo as being in the embryo, but only as that which imparts the motion and as the form; so the medical art cures the patient.

This a priori argument is confirmed by the facts. For it is for this reason that some males which unite with the female do not, it appears, insert any part of themselves into the female, but on the contrary the female inserts a part of herself into the male; this occurs in some insects. For the effect produced by the semen in the female (in the case of those animals whose males do insert a part) is produced in the case of these insects by the heat and power in the male animal itself when the female

inserts that part of herself which receives the secretion. And therefore such animals remain united a long time, and when they are separated the young are produced quickly. For the union lasts until that which is analogous to the semen has done its work, and when they separate the female produces the embryo quickly; for the young is imperfect inasmuch as all such creatures give birth to scoleces.

What occurs in birds and oviparous fishes is the greatest proof that neither does the semen come from all parts of the male nor does he emit anything of such a nature as to exist within that which is generated, as part of the material embryo, but that he only makes a living creature by the power which resides in the semen (as we said in the case of those insects whose females insert a part of themselves into the male). For if a hen-bird is in process of producing wind-eggs and is then trodden by the cock before the egg has begun to whiten and while it is all still yellow, then they become fertile instead of being wind-eggs. And if while it is still yellow she be trodden by another cock, the whole brood of chicks turn out like the second cock. Hence some of those who are anxious to rear fine birds act thus; they change the cocks for the first and second treading, not as if they thought that the semen is mingled with the egg or exists in it, or that it comes from all parts of the cock; for if it did it would have come from both cocks, so that the chick would have all its parts doubled. But it is by its force that the semen of the male gives a certain quality to the material and the nutriment in the female, for the second semen added to the first can produce this effect by heat and concoction, as the egg acquires nutriment so long as it is growing.

The same conclusion is to be drawn from the generation of oviparous fishes. When the female has laid her eggs, the male spinkles the milt over them, and those eggs are fertilized which it reaches, but not the others; this shows that the male does not

contribute anything to the quantity but only to the quality of the embryo.

From what has been said it is plain that the semen does not come from the whole of the body of the male in those animals which emit it, and that the contribution of the female to the generative product is not the same as that of the male, but the male contributes the principle of movement and the female the material. This is why the female does not produce offspring by herself, for she needs a principle, i.e. something to begin the movement in the embryo and to define the form it is to assume. Yet in some animals, as birds, the nature of the female unassisted can generate to a certain extent, for they do form something, only it is incomplete; I mean the so-called wind-eggs.

22

For the same reason the development of the embryo takes place in the female; neither the male himself nor the female emits semen into the male, but the female receives within herself the share contributed by both, because in the female is the material from which is made the resulting product. Not only must the mass of material exist there from which the embryo is formed in the first instance, but further material must constantly be added that it may increase in size. Therefore the birth must take place in the female. For the carpenter must keep in close connexion with his timber and the potter with his clay, and generally all workmanship and the ultimate movement imparted to matter must be connected with the material concerned, as, for instance, architecture is in the buildings it makes.

From these considerations we may also gather how it is that the male contributes to generation. The male does not emit semen at all in some animals, and where he does this is no part of the resulting embryo; just so no material part comes from the carpenter to the material, i.e. the wood in which he works, nor does any part of the carpenter's art exist within what he makes, but the shape and the form are imparted from him to the material by means of the motion he sets up. It is his hands that move his tools, his tools that move the material; it is his knowledge of his art, and his soul, in which is the form, that moves his hands or any other part of him with a motion of some definite kind, a motion varying with the varying nature of the object made. In like manner, in the male of those animals which emit semen Nature uses the semen as a tool and as possessing motion in actuality, just as tools are used in the products of any art, for in them lies in a certain sense the motion of the art. Such, then, is the way in which these males contribute to generation. But when the male does not emit semen, but the female inserts some part of herself into the male, this is parallel to a case in which a man should carry the material to the workman. For by reason of weakness in such males Nature is not able to do anything by any secondary means, but the movements imparted to the material are scarcely strong enough when Nature herself watches over them. Thus here she resembles a modeller in clay rather than a carpenter, for she does not touch the work she is forming by means of tools, but, as it were, with her own hands.

23

In all animals which can move about, the sexes are separated, one individual being male and one female, though both are the

same in species, as with man and horse. But in plants these powers are mingled, female not being separated from male. Wherefore they generate out of themselves, and do not emit semen but produce an embryo, what is called the seed. Empedocles puts this well in the line: ‘and thus the tall trees oviposit; first olives...’ For as the egg is an embryo, a certain part of it giving rise to the animal and the rest being nutriment, so also from a part of the seed springs the growing plant, and the rest is nutriment for the shoot and the first root.

In a certain sense the same thing happens also in those animals which have the sexes separate. For when there is need for them to generate the sexes are no longer separated any more than in plants, their nature desiring that they shall become one; and this is plain to view when they copulate and are united, that one animal is made out of both.

It is the nature of those creatures which do not emit semen to remain united a long time until the male element has formed the embryo, as with those insects which copulate. The others so remain only until the male has discharged from the parts of himself introduced something which will form the embryo in a longer time, as among the sanguinea. For the former remain paired some part of a day, while the semen forms the embryo in several days. And after emitting this they cease their union.

And animals seem literally to be like divided plants, as though one should separate and divide them, when they bear seed, into the male and female existing in them.

In all this Nature acts like an intelligent workman. For to the essence of plants belongs no other function or business than the production of seed; since, then, this is brought about by the union of male and female, Nature has mixed these and set them together in plants, so that the sexes are not divided in them. Plants, however, have been investigated elsewhere. But

the function of the animal is not only to generate (which is common to all living things), but they all of them participate also in a kind of knowledge, some more and some less, and some very little indeed. For they have sense-perception, and this is a kind of knowledge. (If we consider the value of this we find that it is of great importance compared with the class of lifeless objects, but of little compared with the use of the intellect. For against the latter the mere participation in touch and taste seems to be practically nothing, but beside absolute insensibility it seems most excellent; for it would seem a treasure to gain even this kind of knowledge rather than to lie in a state of death and non-existence.) Now it is by sense-perception that an animal differs from those organisms which have only life. But since, if it is a living animal, it must also live; therefore, when it is necessary for it to accomplish the function of that which has life, it unites and copulates, becoming like a plant, as we said before.

Testaceous animals, being intermediate between animals and plants, perform the function of neither class as belonging to both. As plants they have no sexes, and one does not generate in another; as animals they do not bear fruit from themselves like plants; but they are formed and generated from a liquid and earthy concretion. However, we must speak later of the generation of these animals.

Book II

1

That the male and the female are the principles of generation has been previously stated, as also what is their power and their essence. But why is it that one thing becomes and is male, another female? It is the business of our discussion as it proceeds to try and point out (1) that the sexes arise from Necessity and the first efficient cause, (2) from what sort of material they are formed. That (3) they exist because it is better and on account of the final cause, takes us back to a principle still further remote.

Now (1) some existing things are eternal and divine whilst others admit of both existence and non-existence. But (2) that which is noble and divine is always, in virtue of its own nature, the cause of the better in such things as admit of being better or worse, and what is not eternal does admit of existence and non-existence, and can partake in the better and the worse. And (3) soul is better than body, and living, having soul, is thereby better than the lifeless which has none, and being is better than not being, living than not living. These, then, are the reasons of the generation of animals. For since it is impossible that such a class of things as animals should be of an eternal nature, therefore that which comes into being is eternal in the only way possible. Now it is impossible for it to be eternal as an individual (though of course the real essence of things is in the individual) – were it such it would be eternal – but it is possible for it as a species. This is why there is always a class of men and animals and plants. But since the male and female essences are the first principles of these, they will exist in the existing

individuals for the sake of generation. Again, as the first efficient or moving cause, to which belong the definition and the form, is better and more divine in its nature than the material on which it works, it is better that the superior principle should be separated from the inferior. Therefore, wherever it is possible and so far as it is possible, the male is separated from the female. For the first principle of the movement, or efficient cause, whereby that which comes into being is male, is better and more divine than the material whereby it is female. The male, however, comes together and mingles with the female for the work of generation, because this is common to both.

A thing lives, then, in virtue of participating in the male and female principles, wherefore even plants have some kind of life; but the class of animals exists in virtue of sense-perception. The sexes are divided in nearly all of these that can move about, for the reasons already stated, and some of them, as said before, emit semen in copulation, others not. The reason of this is that the higher animals are more independent in their nature, so that they have greater size, and this cannot exist without vital heat; for the greater body requires more force to move it, and heat is a motive force. Therefore, taking a general view, we may say that sanguinea are of greater size than bloodless animals, and those which move about than those which remain fixed. And these are just the animals which emit semen on account of their heat and size.

So much for the cause of the existence of the two sexes. Some animals bring to perfection and produce into the world a creature like themselves, as all those which bring their young into the world alive; others produce something undeveloped which has not yet acquired its own form; in this latter division the sanguinea lay eggs, the bloodless animals either lay an egg or give birth to a scolex. The difference between egg and scolex

is this: an egg is that from a part of which the young comes into being, the rest being nutriment for it; but the whole of a scolex is developed into the whole of the young animal. Of the vivipara, which bring into the world an animal like themselves, some are internally viviparous (as men, horses, cattle, and of marine animals dolphins and the other cetacea); others first lay eggs within themselves, and only after this are externally viviparous (as the cartilaginous fishes). Among the ovipara some produce the egg in a perfect condition (as birds and all oviparous quadrupeds and footless animals, e.g. lizards and tortoises and most snakes; for the eggs of all these do not increase when once laid). The eggs of others are imperfect; such are those of fishes, crustaceans, and cephalopods, for their eggs increase after being produced.

All the vivipara are sanguineous, and the sanguinea are either viviparous or oviparous, except those which are altogether infertile. Among bloodless animals the insects produce a scolex, alike those that are generated by copulation and those that copulate themselves though not so generated. For there are some insects of this sort, which though they come into being by spontaneous generation are yet male and female; from their union something is produced, only it is imperfect; the reason of this has been previously stated.

These classes admit of much cross-division. Not all bipeds are viviparous (for birds are oviparous), nor are they all oviparous (for man is viviparous), nor are all quadrupeds oviparous (for horses, cattle, and countless others are viviparous), nor are they all viviparous (for lizards, crocodiles, and many others lay eggs). Nor does the presence or absence of feet make the difference between them, for not only are some footless animals viviparous, as vipers and the cartilaginous fishes, while others are oviparous, as the other fishes and serpents, but also among those which have feet many are oviparous and many

viviparous, as the quadrupeds above mentioned. And some which have feet, as man, and some which have not, as the whale and dolphin, are internally viviparous. By this character then it is not possible to divide them, nor is any of the locomotive organs the cause of this difference, but it is those animals which are more perfect in their nature and participate in a purer element which are viviparous, for nothing is internally viviparous unless it receive and breathe out air. But the more perfect are those which are hotter in their nature and have more moisture and are not earthy in their composition. And the measure of natural heat is the lung when it has blood in it, for generally those animals which have a lung are hotter than those which have not, and in the former class again those whose lung is not spongy nor solid nor containing only a little blood, but soft and full of blood. And as the animal is perfect but the egg and the scolex are imperfect, so the perfect is naturally produced from the more perfect. If animals are hotter as shown by their possessing a lung but drier in their nature, or are colder but have more moisture, then they either lay a perfect egg or are viviparous after laying an egg within themselves. For birds and scaly reptiles because of their heat produce a perfect egg, but because of their dryness it is only an egg; the cartilaginous fishes have less heat than these but more moisture, so that they are intermediate, for they are both oviparous and viviparous within themselves, the former because they are cold, the latter because of their moisture; for moisture is vivifying, whereas dryness is furthest removed from what has life. Since they have neither feathers nor scales such as either reptiles or other fishes have, all which are signs rather of a dry and earthy nature, the egg they produce is soft; for the earthy matter does not come to the surface in their eggs any more than in themselves. This is why they lay eggs in themselves, for if the egg were laid externally it would be destroyed, having no protection.

Animals that are cold and rather dry than moist also lay eggs, but the egg is imperfect; at the same time, because they are of an earthy nature and the egg they produce is imperfect, therefore it has a hard integument that it may be preserved by the protection of the shell-like covering. Hence fishes, because they are scaly, and crustacea, because they are of an earthy nature, lay eggs with a hard integument.

The cephalopods, having themselves bodies of a sticky nature, preserve in the same way the imperfect eggs they lay, for they deposit a quantity of sticky material about the embryo. All insects produce a scolex. Now all the insects are bloodless, wherefore all creatures that produce a scolex from themselves are so. But we cannot say simply that all bloodless animals produce a scolex, for the classes overlap one another, (1) the insects, (2) the animals that produce a scolex, (3) those that lay their egg imperfect, as the scaly fishes, the crustacea, and the cephalopoda. I say that these form a gradation, for the eggs of these latter resemble a scolex, in that they increase after oviposition, and the scolex of insects again as it develops resembles an egg; how so we shall explain later.

We must observe how rightly Nature orders generation in regular gradation. The more perfect and hotter animals produce their young perfect in respect of quality (in respect of quantity this is so with no animal, for the young always increase in size after birth), and these generate living animals within themselves from the first. The second class do not generate perfect animals within themselves from the first (for they are only viviparous after first laying eggs), but still they are externally viviparous. The third class do not produce a perfect animal, but an egg, and this egg is perfect. Those whose nature is still colder than these produce an egg, but an imperfect one, which is perfected outside the body, as the class of scaly fishes, the crustacea, and the cephalopods. The fifth and coldest class

does not even lay an egg from itself; but so far as the young ever attain to this condition at all, it is outside the body of the parent, as has been said already. For insects produce a scolex first; the scolex after developing becomes egg-like (for the so-called chrysalis or pupa is equivalent to an egg); then from this it is that a perfect animal comes into being, reaching the end of its development in the second change.

Some animals then, as said before, do not come into being from semen, but all the sanguinea do so which are generated by copulation, the male emitting semen into the female when this has entered into her the young are formed and assume their peculiar character, some within the animals themselves when they are viviparous, others in eggs.

There is a considerable difficulty in understanding how the plant is formed out of the seed or any animal out of the semen. Everything that comes into being or is made must (1) be made out of something, (2) be made by the agency of something, and (3) must become something. Now that out of which it is made is the material; this some animals have in its first form within themselves, taking it from the female parent, as all those which are not born alive but produced as a scolex or an egg; others receive it from the mother for a long time by sucking, as the young of all those which are not only externally but also internally viviparous. Such, then, is the material out of which things come into being, but we now are inquiring not out of what the parts of an animal are made, but by what agency. Either it is something external which makes them, or else something existing in the seminal fluid and the semen; and this must either be soul or a part of soul, or something containing soul.

Now it would appear irrational to suppose that any of either the internal organs or the other parts is made by something

external, since one thing cannot set up a motion in another without touching it, nor can a thing be affected in any way by another if it does not set up a motion in it. Something then of the sort we require exists in the embryo itself, being either a part of it or separate from it. To suppose that it should be something else separate from it is irrational. For after the animal has been produced does this something perish or does it remain in it? But nothing of the kind appears to be in it, nothing which is not a part of the whole plant or animal. Yet, on the other hand, it is absurd to say that it perishes after making either all the parts or only some of them. If it makes some of the parts and then perishes, what is to make the rest of them? Suppose this something makes the heart and then perishes, and the heart makes another organ, by the same argument either all the parts must perish or all must remain. Therefore it is preserved and does not perish. Therefore it is a part of the embryo itself which exists in the semen from the beginning; and if indeed there is no part of the soul which does not exist in some part of the body, it would also be a part containing soul in it from the beginning.

How, then, does it make the other parts? Either all the parts, as heart, lung, liver, eye, and all the rest, come into being together or in succession, as is said in the verse ascribed to Orpheus, for there he says that an animal comes into being in the same way as the knitting of a net. That the former is not the fact is plain even to the senses, for some of the parts are clearly visible as already existing in the embryo while others are not; that it is not because of their being too small that they are not visible is clear, for the lung is of greater size than the heart, and yet appears later than the heart in the original development. Since, then, one is earlier and another later, does the one make the other, and does the later part exist on account of the part which is next to it, or rather does the one come into being only after the other? I mean, for instance, that it is not the fact that the

heart, having come into being first, then makes the liver, and the liver again another organ, but that the liver only comes into being after the heart, and not by the agency of the heart, as a man becomes a man after being a boy, not by his agency. An explanation of this is that, in all the productions of Nature or of art, what already exists potentially is brought into being only by what exists actually; therefore if one organ formed another the form and the character of the later organ would have to exist in the earlier, e.g. the form of the liver in the heart. And otherwise also the theory is strange and fictitious.

Yet again, if the whole animal or plant is formed from semen or seed, it is impossible that any part of it should exist ready made in the semen or seed, whether that part be able to make the other parts or no. For it is plain that, if it exists in it from the first, it was made by that which made the semen. But semen must be made first, and that is the function of the generating parent. So, then, it is not possible that any part should exist in it, and therefore it has not within itself that which makes the parts.

But neither can this agent be external, and yet it must needs be one or other of the two. We must try, then, to solve this difficulty, for perhaps some one of the statements made cannot be made without qualification, e.g. the statement that the parts cannot be made by what is external to the semen. For if in a certain sense they cannot, yet in another sense they can. (Now it makes no difference whether we say 'the semen' or 'that from which the semen comes', in so far as the semen has in itself the movement initiated by the other.) It is possible, then, that A should move B, and B move C; that, in fact, the case should be the same as with the automatic machines shown as curiosities. For the parts of such machines while at rest have a sort of potentiality of motion in them, and when any external force puts the first of them in motion, immediately the next is moved

in actuality. As, then, in these automatic machines the external force moves the parts in a certain sense (not by touching any part at the moment, but by having touched one previously), in like manner also that from which the semen comes, or in other words that which made the semen, sets up the movement in the embryo and makes the parts of it by having first touched something though not continuing to touch it. In a way it is the innate motion that does this, as the act of building builds the house. Plainly, then, while there is something which makes the parts, this does not exist as a definite object, nor does it exist in the semen at the first as a complete part.

But how is each part formed? We must answer this by starting in the first instance from the principle that, in all products of Nature or art, a thing is made by something actually existing out of that which is potentially such as the finished product. Now the semen is of such a nature, and has in it such a principle of motion, that when the motion is ceasing each of the parts comes into being, and that as a part having life or soul. For there is no such thing as face or flesh without life or soul in it; it is only equivocally that they will be called face or flesh if the life has gone out of them, just as if they had been made of stone or wood. And the homogeneous parts and the organic come into being together. And just as we should not say that an axe or other instrument or organ was made by the fire alone, so neither shall we say that foot or hand were made by heat alone. The same applies also to flesh, for this too has a function. While, then, we may allow that hardness and softness, stickiness and brittleness, and whatever other qualities are found in the parts that have life and soul, may be caused by mere heat and cold, yet, when we come to the principle in virtue of which flesh is flesh and bone is bone, that is no longer so; what makes them is the movement set up by the male parent, who is in actuality what that out of which the offspring is made is in potentiality. This is what we find in the products of

art; heat and cold may make the iron soft and hard, but what makes a sword is the movement of the tools employed, this movement containing the principle of the art. For the art is the starting-point and form of the product; only it exists in something else, whereas the movement of Nature exists in the product itself, issuing from another nature which has the form in actuality.

Has the semen soul, or not? The same argument applies here as in the question concerning the parts. As no part, if it participate not in soul, will be a part except in an equivocal sense (as the eye of a dead man is still called an 'eye'), so no soul will exist in anything except that of which it is soul; it is plain therefore that semen both has soul, and is soul, potentially.

But a thing existing potentially may be nearer or further from its realization in actuality, as e.g. a mathematician when asleep is further from his realization in actuality as engaged in mathematics than when he is awake, and when awake again but not studying mathematics he is further removed than when he is so studying. Accordingly it is not any part that is the cause of the soul's coming into being, but it is the first moving cause from outside. (For nothing generates itself, though when it has come into being it thenceforward increases itself.) Hence it is that only one part comes into being first and not all of them together. But that must first come into being which has a principle of increase (for this nutritive power exists in all alike, whether animals or plants, and this is the same as the power that enables an animal or plant to generate another like itself, that being the function of them all if naturally perfect). And this is necessary for the reason that whenever a living thing is produced it must grow. It is produced, then, by something else of the same name, as e.g. man is produced by man, but it is increased by means of itself. There is, then, something which increases it. If this is a single part, this must come into being

first. Therefore if the heart is first made in some animals, and what is analogous to the heart in the others which have no heart, it is from this or its analogue that the first principle of movement would arise.

We have thus discussed the difficulties previously raised on the question what is the efficient cause of generation in each case, as the first moving and formative power.

2

The next question to be mooted concerns the nature of semen. For whereas when it issues from the animal it is thick and white, yet on cooling it becomes liquid as water, and its colour is that of water. This would appear strange, for water is not thickened by heat; yet semen is thick when it issues from within the animal's body which is hot, and becomes liquid on cooling. Again, watery fluids freeze, but semen, if exposed in frosts to the open air, does not freeze but liquefies, as if it was thickened by the opposite of cold. Yet it is unreasonable, again, to suppose that it is thickened by heat. For it is only substances having a predominance of earth in their composition that coagulate and thicken on boiling, e.g. milk. It ought then to solidify on cooling, but as a matter of fact it does not become solid in any part but the whole of it goes like water.

This then is the difficulty. If it is water, water evidently does not thicken through heat, whereas the semen is thick and both it and the body whence it issues are hot. If it is made of earth or a mixture of earth and water, it ought not to liquefy entirely and turn to water.

Perhaps, however, we have not discriminated all the possibilities. It is not only the liquids composed of water and earthy matter that thicken, but also those composed of water and air; foam, for instance, becomes thicker and white, and the smaller and less visible the bubbles in it, the whiter and firmer does the mass appear. The same thing happens also with oil; on mixing with air it thickens, wherefore that which is whitening becomes thicker, the watery part in it being separated off by the heat and turning to air. And if oxide of lead is mixed with water or even with oil, the mass increases greatly and changes from liquid and dark to firm and white, the reason being that air is mixed in with it which increases the mass and makes the white shine through, as in foam and snow (for snow is foam). And water itself on mingling with oil becomes thick and white, because air is entangled in it by the act of pounding them together, and oil itself has much air in it (for shininess is a property of air, not of earth or water). This too is why it floats on the surface of the water, for the air contained in it as in a vessel bears it up and makes it float, being the cause of its lightness. So too oil is thickened without freezing in cold weather and frosts; it does not freeze because of its heat (for the air is hot and will not freeze), but because the air is forced together and compressed, as..., by the cold, the oil becomes thicker. These are the reasons why semen is firm and white when it issues from within the animal; it has a quantity of hot air in it because of the internal heat; afterwards, when the heat has evaporated and the air has cooled, it turns liquid and dark; for the water, and any small quantity of earthy matter there may be, remain in semen as it dries, as they do in phlegm.

Semen, then, is a compound of spirit (pneuma) and water, and the former is hot air (aerh); hence semen is liquid in its nature because it is made of water. What Ctesias the Cnidian has asserted of the semen of elephants is manifestly untrue; he says that it hardens so much in drying that it becomes like

amber. But this does not happen, though it is true that one semen must be more earthy than another, and especially so with animals that have much earthy matter in them because of the bulk of their bodies. And it is thick and white because it is mixed with spirit, for it is also an invariable rule that it is white, and Herodotus does not report the truth when he says that the semen of the Aethiopians is black, as if everything must needs be black in those who have a black skin, and that too when he saw their teeth were white. The reason of the whiteness of semen is that it is a foam, and foam is white, especially that which is composed of the smallest parts, small in the sense that each bubble is invisible, which is what happens when water and oil are mixed and shaken together, as said before. (Even the ancients seem to have noticed that semen is of the nature of foam; at least it was from this they named the goddess who presides over union.)

This then is the explanation of the problem proposed, and it is plain too that this is why semen does not freeze; for air will not freeze.

3

The next question to raise and to answer is this. If, in the case of those animals which emit semen into the female, that which enters makes no part of the resulting embryo, where is the material part of it diverted if (as we have seen) it acts by means of the power residing in it? It is not only necessary to decide whether what is forming in the female receives anything material, or not, from that which has entered her, but also concerning the soul in virtue of which an animal is so called (and this is in virtue of the sensitive part of the soul) – does this

exist originally in the semen and in the unfertilized embryo or not, and if it does whence does it come? For nobody would put down the unfertilized embryo as soulless or in every sense bereft of life (since both the semen and the embryo of an animal have every bit as much life as a plant), and it is productive up to a certain point. That then they possess the nutritive soul is plain (and plain is it from the discussions elsewhere about soul why this soul must be acquired first). As they develop they also acquire the sensitive soul in virtue of which an animal is an animal. For e.g. an animal does not become at the same time an animal and a man or a horse or any other particular animal. For the end is developed last, and the peculiar character of the species is the end of the generation in each individual. Hence arises a question of the greatest difficulty, which we must strive to solve to the best of our ability and as far as possible. When and how and whence is a share in reason acquired by those animals that participate in this principle? It is plain that the semen and the unfertilized embryo, while still separate from each other, must be assumed to have the nutritive soul potentially, but not actually, except that (like those unfertilized embryos that are separated from the mother) it absorbs nourishment and performs the function of the nutritive soul. For at first all such embryos seem to live the life of a plant. And it is clear that we must be guided by this in speaking of the sensitive and the rational soul. For all three kinds of soul, not only the nutritive, must be possessed potentially before they are possessed in actuality. And it is necessary either (1) that they should all come into being in the embryo without existing previously outside it, or (2) that they should all exist previously, or (3), that some should so exist and others not. Again, it is necessary that they should either (1) come into being in the material supplied by the female without entering with the semen of the male, or (2) come from the male and be imparted to the material in the female. If the latter, then

either all of them, or none, or some must come into being in the male from outside.

Now that it is impossible for them all to preexist is clear from this consideration. Plainly those principles whose activity is bodily cannot exist without a body, e.g. walking cannot exist without feet. For the same reason also they cannot enter from outside. For neither is it possible for them to enter by themselves, being inseparable from a body, nor yet in a body, for the semen is only a secretion of the nutriment in process of change. It remains, then, for the reason alone so to enter and alone to be divine, for no bodily activity has any connexion with the activity of reason.

Now it is true that the faculty of all kinds of soul seems to have a connexion with a matter different from and more divine than the so-called elements; but as one soul differs from another in honour and dishonour, so differs also the nature of the corresponding matter. All have in their semen that which causes it to be productive; I mean what is called vital heat. This is not fire nor any such force, but it is the spiritus included in the semen and the foam-like, and the natural principle in the spiritus, being analogous to the element of the stars. Hence, whereas fire generates no animal and we do not find any living thing forming in either solids or liquids under the influence of fire, the heat of the sun and that of animals does generate them. Not only is this true of the heat that works through the semen, but whatever other residuum of the animal nature there may be, this also has still a vital principle in it. From such considerations it is clear that the heat in animals neither is fire nor derives its origin from fire.

Let us return to the material of the semen, in and with which comes away from the male the spiritus conveying the principle of soul. Of this principle there are two kinds; the one is not

connected with matter, and belongs to those animals in which is included something divine (to wit, what is called the reason), while the other is inseparable from matter. This material of the semen dissolves and evaporates because it has a liquid and watery nature. Therefore we ought not to expect it always to come out again from the female or to form any part of the embryo that has taken shape from it; the case resembles that of the fig-juice which curdles milk, for this too changes without becoming any part of the curdling masses.

It has been settled, then, in what sense the embryo and the semen have soul, and in what sense they have not; they have it potentially but not actually.

Now semen is a secretion and is moved with the same movement as that in virtue of which the body increases (this increase being due to subdivision of the nutriment in its last stage). When it has entered the uterus it puts into form the corresponding secretion of the female and moves it with the same movement wherewith it is moved itself. For the female's contribution also is a secretion, and has all the arts in it potentially though none of them actually; it has in it potentially even those parts which differentiate the female from the male, for just as the young of mutilated parents are sometimes born mutilated and sometimes not, so also the young born of a female are sometimes female and sometimes male instead. For the female is, as it were, a mutilated male, and the catamenia are semen, only not pure; for there is only one thing they have not in them, the principle of soul. For this reason, whenever a wind-egg is produced by any animal, the egg so forming has in it the parts of both sexes potentially, but has not the principle in question, so that it does not develop into a living creature, for this is introduced by the semen of the male. When such a principle has ben imparted to the secretion of the female it becomes an embryo.

Liquid but corporeal substances become surrounded by some kind of covering on heating, like the solid scum which forms on boiled foods when cooling. All bodies are held together by the glutinous; this quality, as the embryo develops and increases in size, is acquired by the sinewy substance, which holds together the parts of animals, being actual sinew in some and its analogue in others. To the same class belong also skin, blood-vessels, membranes, and the like, for these differ in being more or less glutinous and generally in excess and deficiency.

4

In those animals whose nature is comparatively imperfect, when a perfect embryo (which, however, is not yet a perfect animal) has been formed, it is cast out from the mother, for reasons previously stated. An embryo is then complete when it is either male or female, in the case of those animals who possess this distinction, for some (i.e. all those which are not themselves produced from a male or female parent nor from a union of the two) produce an offspring which is neither male nor female. Of the generation of these we shall speak later.

The perfect animals, those internally viviparous, keep the developing embryo within themselves and in close connexion until they give birth to a complete animal and bring it to light.

A third class is externally viviparous but first internally oviparous; they develop the egg into a perfect condition, and then in some cases the egg is set free as with creatures externally oviparous, and the animal is produced from the egg within the mother's body; in other cases, when the nutriment from the egg is consumed, development is completed by connection with the uterus, and therefore the egg is not set free

from the uterus. This character marks the cartilaginous fish, of which we must speak later by themselves.

Here we must make our first start from the first class; these are the perfect or viviparous animals, and of these the first is man. Now the secretion of the semen takes place in all of them just as does that of any other residual matter. For each is conveyed to its proper place without any force from the breath or compulsion of any other cause, as some assert, saying that the generative parts attract the semen like cupping-glasses, aided by the force of the breath, as if it were possible for either this secretion or the residue of the solid and liquid nutriment to go anywhere else than they do without the exertion of such a force. Their reason is that the discharge of both is attended by holding the breath, but this is a common feature of all cases when it is necessary to move anything, because strength arises through holding the breath. Why, even without this force the secretions or excretions are discharged in sleep if the parts concerned are full of them and are relaxed. One might as well say that it is by the breath that the seeds of plants are always segregated to the places where they are wont to bear fruit. No, the real cause, as has been stated already, is that there are special parts for receiving all the secretions, alike the useless (as the residues of the liquid and solid nutriment), and the blood, which has the so-called blood-vessels.

To consider now the region of the uterus in the female – the two blood-vessels, the great vessel and the aorta, divide higher up, and many fine vessels from them terminate in the uterus. These become over-filled from the nourishment they convey, nor is the female nature able to concoct it, because it is colder than man's; so the blood is excreted through very fine vessels into the uterus, these being unable on account of their narrowness to receive the excessive quantity, and the result is a sort of haemorrhage. The period is not accurately defined in women,

but tends to return during the waning of the moon. This we should expect, for the bodies of animals are colder when the environment happens to become so, and the time of change from one month to another is cold because of the absence of the moon, whence also it results that this time is stormier than the middle of the month. When then the residue of the nourishment has changed into blood, the catamenia tend to occur at the above-mentioned period, but when it is not concocted a little matter at a time is always coming away, and this is why 'whites' appear in females while still small, in fact mere children. If both these discharges of the secretions are moderate, the body remains in good health, for they act as a purification of the secretions which are the causes of a morbid state of body; if they do not occur at all or if they are excessive, they are injurious, either causing illness or pulling down the patient; hence whites, if continuous and excessive, prevent girls from growing. This secretion then is necessarily discharged by females for the reasons given; for, the female nature being unable to concoct the nourishment thoroughly, there must not only be left a residue of the useless nutriment, but also there must be a residue in the blood-vessels, and this filling the channels of the finest vessels must overflow. Then Nature, aiming at the best end, uses it up in this place for the sake of generation, that another creature may come into being of the same kind as the former was going to be, for the menstrual blood is already potentially such as the body from which it is discharged.

In all females, then, there must necessarily be such a secretion, more indeed in those that have blood and of these most of all in man, but in the others also some matter must be collected in the uterine region. The reason why there is more in those that have blood and most in man has been already given, but why, if all females have such a secretion, have not all males one to correspond? For some of them do not emit semen but, just as

those which do emit it fashion by the movement in the semen the mass forming from the material supplied by the female, so do the animals in question bring the same to pass and exert the same formative power by the movement within themselves in that part from whence the semen is secreted. This is the region about the diaphragm in all those animals which have one, for the heart or its analogue is the first principle of a natural body, while the lower part is a mere addition for the sake of it. Now the reason why it is not all males that have a generative secretion, while all females do, is that the animal is a body with Soul or life; the female always provides the material, the male that which fashions it, for this is the power that we say they each possess, and this is what is meant by calling them male and female. Thus while it is necessary for the female to provide a body and a material mass, it is not necessary for the male, because it is not within the work of art or the embryo that the tools or the maker must exist. While the body is from the female, it is the soul that is from the male, for the soul is the reality of a particular body. For this reason if animals of a different kind are crossed (and this is possible when the periods of gestation are equal and conception takes place nearly at the same season and there is no great difference in the of the animals), the first cross has a common resemblance to both parents, as the hybrid between fox and dog, partridge and domestic fowl, but as time goes on and one generation springs from another, the final result resembles the female in form, just as foreign seeds produce plants varying in accordance with the country in which they are sown. For it is the soil that gives to the seeds the material and the body of the plant. And hence the part of the female which receives the semen is not a mere passage, but the uterus has a considerable width, whereas the males that emit semen have only passages for this purpose, and these are bloodless.

Each of the secretions becomes such at the moment when it is in its proper place; before that there is nothing of the sort unless with much violence and contrary to nature.

We have thus stated the reason for which the generative secretions are formed in animals. But when the semen from the male (in those animals which emit semen) has entered, it puts into form the purest part of the female secretion (for the greater part of the catamenia also is useless and fluid, as is the most fluid part of the male secretion, i.e. in a single emission, the earlier discharge being in most cases apt to be infertile rather than the later, having less vital heat through want of concoction, whereas that which is concocted is thick and of a more material nature).

If there is no external discharge, either in women or other animals, on account of there not being much useless and superfluous matter in the secretion, then the quantity forming within the female altogether is as much as what is retained within those animals which have an external discharge; this is put into form by the power of the male residing in the semen secreted by him, or, as is clearly seen to happen in some insects, by the part in the female analogous to the uterus being inserted into the male.

It has been previously stated that the discharge accompanying sexual pleasure in the female contributes nothing to the embryo. The chief argument for the opposite view is that what are called bad dreams occur by night with women as with men; but this is no proof, for the same thing happens to young men also who do not yet emit semen, and to those who do emit semen but whose semen is infertile.

It is impossible to conceive without the emission of the male in union and without the secretion of the corresponding female material, whether it be discharged externally or whether there

is only enough within the body. Women conceive, however, without experiencing the pleasure usual in such intercourse, if the part chance to be in heat and the uterus to have descended. But generally speaking the opposite is the case, because the os uteri is not closed when the discharge takes place which is usually accompanied by pleasure in women as well as men, and when this is so there is a readier way for the semen of the male to be drawn into the uterus.

The actual discharge does not take place within the uterus as some think, the os uteri being too narrow, but it is in the region in front of this, where the female discharges the moisture found in some cases, that the male emits the semen. Sometimes it remains in this place; at other times, if the uterus chance to be conveniently placed and hot on account of the purgation of the catamenia, it draws it within itself. A proof of this is that pessaries, though wet when applied, are removed dry. Moreover, in all those animals which have the uterus near the hypozoma, as birds and viviparous fishes, it is impossible that the semen should be so discharged as to enter it; it must be drawn into it. This region, on account of the heat which is in it, attracts the semen. The discharge and collection of the catamenia also excite heat in this part. Hence it acts like cone-shaped vessels which, when they have been washed out with hot water, their mouth being turned downwards, draw water into themselves. And this is the way things are drawn up, but some say that nothing of the kind happens with the organic parts concerned in copulation. Precisely the opposite is the case of those who say the woman emits semen as well as the man, for if she emits it outside the uterus this must then draw it back again into itself if it is to be mixed with the semen of the male. But this is a superfluous proceeding, and Nature does nothing superfluous.

When the material secreted by the female in the uterus has been fixed by the semen of the male (this acts in the same way

as rennet acts upon milk, for rennet is a kind of milk containing vital heat, which brings into one mass and fixes the similar material, and the relation of the semen to the catamenia is the same, milk and the catamenia being of the same nature) – when, I say, the more solid part comes together, the liquid is separated off from it, and as the earthy parts solidify membranes form all round it; this is both a necessary result and for a final cause, the former because the surface of a mass must solidify on heating as well as on cooling, the latter because the foetus must not be in a liquid but be separated from it. Some of these are called membranes and others choria, the difference being one of more or less, and they exist in ovipara and vivipara alike.

When the embryo is once formed, it acts like the seeds of plants. For seeds also contain the first principle of growth in themselves, and when this (which previously exists in them only potentially) has been differentiated, the shoot and the root are sent off from it, and it is by the root that the plant gets nourishment; for it needs growth. So also in the embryo all the parts exist potentially in a way at the same time, but the first principle is furthest on the road to realization. Therefore the heart is first differentiated in actuality. This is clear not only to the senses (for it is so) but also on theoretical grounds. For whenever the young animal has been separated from both parents it must be able to manage itself, like a son who has set up house away from his father. Hence it must have a first principle from which comes the ordering of the body at a later stage also, for if it is to come in from outside at later period to dwell in it, not only may the question be asked at what time it is to do so, but also we may object that, when each of the parts is separating from the rest, it is necessary that this principle should exist first from which comes growth and movement to the other parts. (Wherefore all who say, as did Democritus, that the external parts of animals are first differentiated and the

internal later, are much mistaken; it is as if they were talking of animals of stone or wood. For such as these have no principle of growth at all, but all animals have, and have it within themselves.) Therefore it is that the heart appears first distinctly marked off in all the sanguinea, for this is the first principle or origin of both homogeneous and heterogeneous parts, since from the moment that the animal or organism needs nourishment, from that moment does this deserve to be called its principle or origin. For the animal grows, and the nutriment, in its final stage, of an animal is the blood or its analogue, and of this the blood-vessels are the receptacle, wherefore the heart is the principle or origin of these also. (This is clear from the Enquiries and the anatomical drawings.)

Since the embryo is already potentially an animal but an imperfect one, it must obtain its nourishment from elsewhere; accordingly it makes use of the uterus and the mother, as a plant does of the earth, to get nourishment, until it is perfected to the point of being now an animal potentially locomotive. So Nature has first designed the two blood-vessels from the heart, and from these smaller vessels branch off to the uterus. These are what is called the umbilicus, for this is a blood-vessel, consisting of one or more vessels in different animals. Round these is a skin-like integument, because the weakness of the vessels needs protection and shelter. The vessels join on to the uterus like the roots of plants, and through them the embryo receives its nourishment. This is why the animal remains in the uterus, not, as Democritus says, that the parts of the embryo may be moulded in conformity with those of the mother. This is plain in the ovipara, for they have their parts differentiated in the egg after separation from the matrix.

Here a difficulty may be raised. If the blood is the nourishment, and if the heart, which first comes into being, already contains blood, and the nourishment comes from outside, whence did

the first nourishment enter? Perhaps it is not true that all of it comes from outside just as in the seeds of plants there is something of this nature, the substance which at first appears milky, so also in the material of the animal embryo the superfluous matter of which it is formed is its nourishment from the first.

The embryo, then, grows by means of the umbilicus in the same way as a plant by its roots, or as animals themselves when separated from the nutriment within the mother, of which we must speak later at the time appropriate for discussing them. But the parts are not differentiated, as some suppose, because like is naturally carried to like. Besides many other difficulties involved in this theory, it results from it that the homogeneous parts ought to come into being each one separate from the rest, as bones and sinews by themselves, and flesh by itself, if one should accept this cause. The real cause why each of them comes into being is that the secretion of the female is potentially such as the animal is naturally, and all the parts are potentially present in it, but none actually. It is also because when the active and the passive come in contact with each other in that way in which the one is active and the other passive (I mean in the right manner, in the right place, and at the right time), straightway the one acts and the other is acted upon. The female, then, provides matter, the male the principle of motion. And as the products of art are made by means of the tools of the artist, or to put it more truly by means of their movement, and this is the activity of the art, and the art is the form of what is made in something else, so is it with the power of the nutritive soul. As later on in the case of mature animals and plants this soul causes growth from the nutriment, using heat and cold as its tools (for in these is the movement of the soul), and each thing comes into being in accordance with a certain formula, so also from the beginning does it form the product of nature. For the material by which this latter grows is

the same as that from which it is constituted at first; consequently also the power which acts upon it is identical with that which originally generated it; if then this acting power is the nutritive soul, this is also the generative soul, and this is the nature of every organism, existing in all animals and plants. [But the other parts of the soul exist in some animals, not in others.] In plants, then, the female is not separated from the male, but in those animals in which it is separated the male needs the female besides.

5

And yet the question may be raised why it is that, if indeed the female possesses the same soul and if it is the secretion of the female which is the material of the embryo, she needs the male besides instead of generating entirely from herself. The reason is that the animal differs from the plant by having sense-perception; if the sensitive soul is not present, either actually or potentially, and either with or without qualification, it is impossible for face, hand, flesh, or any other part to exist; it will be no better than a corpse or part of a corpse. If then, when the sexes are separated, it is the male that has the power of making the sensitive soul, it is impossible for the female to generate an animal from itself alone, for the process in question was seen to involve the male quality. Certainly that there is a good deal in the difficulty stated is plain in the case of the birds that lay wind-eggs, showing that the female can generate up to a certain point unaided. But this still involves a difficulty; in what way are we to say that their eggs live? It neither possible that they should live in the same way as fertile eggs (for then they would produce a chick actually alive), nor yet can they be called eggs only in the sense in which an egg of wood or stone is so called,

for the fact that these eggs go bad shows that they previously participate in some way in life. It is plain, then, that they have some soul potentially. What sort of soul will this be? It must be the lowest surely, and this is the nutritive, for this exists in all animals and plants alike. Why then does it not perfect the parts and the animal? Because they must have a sensitive soul, for the parts of animals are not like those of a plant. And so the female animal needs the help of the male, for in these animals we are speaking of the male is separate. This is exactly what we find, for the wind-eggs become fertile if the male tread the female in a certain space of time. About the cause of these things, however, we shall enter into detail later.

If there is any kind of animal which is female and has no male separate from it, it is possible that this may generate a young one from itself without copulation. No instance of this worthy of credit has been observed up to the present at any rate, but one case in the class of fishes makes us hesitate. No male of the so-called erythrinus has ever yet been seen, but females, and specimens full of roe, have been seen. Of this, however, we have as yet no proof worthy of credit. Again, some members of the class of fishes are neither male nor female, as eels and a kind of mullets found in stagnant waters. But whenever the sexes are separate the female cannot generate perfectly by herself alone, for then the male would exist in vain, and Nature makes nothing in vain. Hence in such animals the male always perfects the work of generation, for he imparts the sensitive soul, either by means of the semen or without it. Now the parts of the embryo already exist potentially in the material, and so when once the principle of movement has been imparted to them they develop in a chain one after another, as the wheels are moved one by another in the automatic machines. When some of the natural philosophers say that like is brought to like, this must be understood, not in the sense that the parts are moved as changing place, but that they stay where they are and

the movement is a change of quality (such as softness, hardness, colour, and the other differences of the homogeneous parts); thus they become in actuality what they previously were in potentiality. And what comes into being first is the first principle; this is the heart in the sanguinea and its analogue in the rest, as has been often said already. This is plain not only to the senses (that it is first to come into being), but also in view of its end; for life fails in the heart last of all, and it happens in all cases that what comes into being last fails first, and the first last, Nature running a double course, so to say, and turning back to the point from whence she started. For the process of becoming is from the non-existent to the existent, and that of perishing is back again from the existent to the non-existent.

6

After this, as said already, the internal parts come into being before the external. The greater become visible before the less, even if some of them do not come into being before them. First the parts above the hypozoma are differentiated and are superior in size; the part below is both smaller and less differentiated. This happens in all animals in which exists the distinction of upper and lower, except in the insects; the growth of those that produce a scolex is towards the upper part, for this is smaller in the beginning. The cephalopoda are the only locomotive animals in which the distinction of upper and lower does not exist.

What has been said applies to plants also, that the upper portion is earlier in development than the lower, for the roots push out from the seed before the shoots.

The agency by which the parts of animals are differentiated is air, not however that of the mother nor yet of the embryo itself, as some of the physicists say. This is manifest in birds, fishes, and insects. For some of these are separated from the mother and produced from an egg, within which the differentiation takes place; other animals do not breathe at all, but are produced as a scolex or an egg; those which do breathe and whose parts are differentiated within the mother's uterus yet do not breathe until the lung is perfected, and the lung and the preceding parts are differentiated before they breathe. Moreover, all polydactylous quadrupeds, as dog, lion, wolf, fox, jackal, produce their young blind, and the eyelids do not separate till after birth. Manifestly the same holds also in all the other parts; as the qualitative, so also the quantitative differentia comes into being, pre-existing potentially but being actualized later by the same causes by which the qualitative distinction is produced, and so the eyelids become two instead of one. Of course air must be present, because heat and moisture are present, the former acting and the latter being acted upon.

Some of the ancient nature-philosolphers made an attempt to state which part comes into being after which, but were not sufficiently acquainted with the facts. It is with the parts as with other things; one naturally exists prior to another. But the word 'prior' is used in more senses than one. For there is a difference between the end or final cause and that which exists for the sake of it; the latter is prior in order of development, the former is prior in reality. Again, that which exists for the sake of the end admits of division into two classes, (1) the origin of the movement, (2) that which is used by the end; I mean, for instance, (1) that which can generate, (2) that which serves as an instrument to what is generated, for the one of these, that which makes, must exist first, as the teacher before the learner, and the other later, as the pipes are later than he who learns to

play upon them, for it is superfluous that men who do not know how to play should have pipes. Thus there are three things: first, the end, by which we mean that for the sake of which something else exists; secondly, the principle of movement and of generation, existing for the sake of the end (for that which can make and generate, considered simply as such, exists only in relation to what is made and generated); thirdly, the useful, that is to say what the end uses. Accordingly, there must first exist some part in which is the principle of movement (I say a part because this is from the first one part of the end and the most important part too); next after this the whole and the end; thirdly and lastly, the organic parts serving these for certain uses. Hence if there is anything of this sort which must exist in animals, containing the principle and end of all their nature, this must be the first to come into being – first, that is, considered as the moving power, but simultaneous with the whole embryo if considered as a part of the end. Therefore all the organic parts whose nature is to bring others into being must always themselves exist before them, for they are for the sake of something else, as the beginning for the sake of the end; all those parts which are for the sake of something else but are not of the nature of beginnings must come into being later. So it is not easy to distinguish which of the parts are prior, those which are for the sake of another or that for the sake of which are the former. For the parts which cause the movement, being prior to the end in order of development, come in to cause confusion, and it is not easy to distinguish these as compared with the organic parts. And yet it is in accordance with this method that we must inquire what comes into being after what; for the end is later than some parts and earlier than others. And for this reason that part which contains the first principle comes into being first, next to this the upper half of the body. This is why the parts about the head, and particularly the eyes, appear largest in the embryo at an early stage, while the parts

below the umbilicus, as the legs, are small; for the lower parts are for the sake of the upper, and are neither parts of the end nor able to form it.

But they do not say well nor do they assign a necessary cause who say simply that ‘it always happens so’, and imagine that this is a first principle in these cases. Thus Democritus of Abdera says that ‘there is no beginning of the infinite; now the cause is a beginning, and the eternal is infinite; in consequence, to ask the cause of anything of this kind is to seek for a beginning of the infinite’. Yet according to this argument, which forbids us to seek the cause, there will be no proof of any eternal truth whatever; but we see that there is a proof of many such, whether by ‘eternal’ we mean what always happens or what exists eternally; it is an eternal truth that the angles of a triangle are always equal to two right angles, or that the diagonal of a square is incommensurable with the side, and nevertheless a cause and a proof can be given for these truths. While, then, it is well said that we must not take on us to seek a beginning (or first principle) of all things, yet this is not well said of all things whatever that always are or always happen, but only of those which really are first principles of the eternal things; for it is by another method, not by proof, that we acquire knowledge of the first principle. Now in that which is immovable and unchanging the first principle is simply the essence of the thing, but when we come to those things which come into being the principles are more than one, varying in kind and not all of the same kind; one of this number is the principle of movement, and therefore in all the sanguinea the heart is formed first, as was said at the beginning, and in the other animals that which is analogous to the heart.

From the heart the blood-vessels extend throughout the body as in the anatomical diagrams which are represented on the wall, for the parts lie round these because they are formed out of

them. The homogeneous parts are formed by heat and cold, for some are put together and solidified by the one and some by the other. The difference between these has already been discussed elsewhere, and it has been stated what kinds of things are soluble by liquid and fire, and what are not soluble by liquid and cannot be melted by fire. The nutriment then oozes through the blood-vessels and the passages in each of the parts, like water in unbaked pottery, and thus is formed the flesh or its analogues, being solidified by cold, which is why it is also dissolved by fire. But all the particles given off which are too earthy, having but little moisture and heat, cool as the moisture evaporates along with the heat; so they become hard and earthy in character, as nails, horns, hoofs, and beaks, and therefore they are softened by fire but none of them is melted by it, while some of them, as egg-shells, are soluble in liquids. The sinews and bones are formed by the internal heat as the moisture dries, and hence the bones are insoluble by fire like pottery, for like it they have been as it were baked in an oven by the heat in the process of development. But it is not anything whatever that is made into flesh or bone by the heat, but only something naturally fitted for the purpose; nor is it made in any place or time whatever, but only in a place and time naturally so fitted. For neither will that which exists potentially be made except by that moving agent which possesses the actuality, nor will that which possesses the actuality make anything whatever; the carpenter would not make a box except out of wood, nor will a box be made out of the wood without the carpenter. The heat exists in the seminal secretion, and the movement and activity in it is sufficient in kind and in quantity to correspond to each of the parts. In so far as there is any deficiency or excess, the resulting product is in worse condition or physically defective, in like manner as in the case of external substances which are thickened by boiling that they may be more palatable or for any other purpose. But in the latter case it is we who apply the heat

in due measure for the motion required; in the former it is the nature of the male parent that gives it, or with animals spontaneously generated it is the movement and heat imparted by the right season of the year that it is the cause.

Cooling, again, is mere deprivation of heat. Nature makes use of both; they have of necessity the power of bringing about different results, but in the development of the embryo we find that the one cools and the other heats for some definite purpose, and so each of the parts is formed; thus it is in one sense by necessity, in another for a final cause, that they make the flesh soft, the sinews solid and elastic, the bones solid and brittle. The skin, again, is formed by the drying of the flesh, like the scum upon boiled substances; it is so formed not only because it is on the outside, but also because what is glutinous, being unable to evaporate, remains on the surface. While in other animals the glutinous is dry, for which reason the covering of the invertebrates is testaceous or crustaceous, in the vertebrates it is rather of the nature of fat. In all of these which are not of too earthy a nature the fat is collected under the covering of the skin, a fact which points to the skin being formed out of such a glutinous substance, for fat is somewhat glutinous. As we said, all these things must be understood to be formed in one sense of necessity, but in another sense not of necessity but for a final cause.

The upper half of the body, then, is first marked out in the order of development; as time goes on the lower also reaches its full size in the sanguinea. All the parts are first marked out in their outlines and acquire later on their colour and softness or hardness, exactly as if Nature were a painter producing a work of art, for painters, too, first sketch in the animal with lines and only after that put in the colours.

Because the source of the sensations is in the heart, therefore this is the part first formed in the whole animal, and because of the heat of this organ the cold forms the brain, where the blood-vessels terminate above, corresponding to the heat of the heart. Hence the parts about the head begin to form next in order after the heart, and surpass the other parts in size, for the brain is from the first large and fluid.

There is a difficulty about what happens with the eyes of animals. Though from the beginning they appear very large in all creatures, whether they walk or swim or fly, yet they are the last of the parts to be formed completely, for in the intervening time they collapse. The reason is this. The sense-organ of the eyes is set upon certain passages, as are the other sense-organs. Whereas those of touch and taste are simply the body itself or some part of the body of animals, those of smell and hearing are passages connecting with the external air and full themselves of innate spiritus; these passages end at the small blood-vessels about the brain which run thither from the heart. But the eye is the only sense-organ that has a bodily constitution peculiar to itself. It is fluid and cold, and does not exist from the first in the place which it occupies later in the same way as the other parts do, for they exist potentially to begin with and actually come into being later, but the eye is the purest part of the liquidity about the brain drained off through the passages which are visible running from them to the membrane round the brain. A proof of this is that, apart from the brain, there is no other part in the head that is cold and fluid except the eye. Of necessity therefore this region is large at first but falls in later. For the same thing happens with the brain; at first it is liquid and large, but in course of evaporation and concoction it becomes more solid and falls in; this applies both to the brain and the eyes. The head is very large at first, on account of the brain, and the eyes appear large because of the liquid in them. They are the last organs to reach completion

because the brain is formed with difficulty; for it is at a late period that it gets rid of its coldness and fluidity; this applies to all animals possessing a brain, but especially to man. For this reason the ‘bregma’ is the last of the bones to be formed; even after birth this bone is still soft in children. The cause of this being so with men more than with other animals is the fact that their brain is the most fluid and largest. This again is because the heat in man’s heart is purest. His intellect shows how well he is tempered, for man is the wisest of animals. And children for a long time have no control over their heads on account of the heaviness of the brain; and the same applies to the parts which it is necessary to move, for it is late that the principle of motion gets control over the upper parts, and last of all over those whose motion is not connected directly with it, as that of the legs is not. Now the eyelid is such a part. But since Nature makes nothing superfluous nor in vain, it is clear also that she makes nothing too late or too soon, for if she did the result would be either in vain or superfluous. Hence it is necessary that the eyelids should be separated at the same time as the heart is able to move them. So then the eyes of animals are perfected late because of the amount of concoction required by the brain, and last of all the parts because the motion must be very strong before it can affect parts so far from the first principle of motion and so cold. And it is plain that such is the nature of the eyelids, for if the head is affected by never so little heaviness through sleepiness or drunkenness or anything else of the kind, we cannot raise the eyelids though their own weight is so small. So much for the question how the eyes come into being, and why and for what cause they are the last to be fully developed.

Each of the other parts is formed out of the nutriment, those most honourable and participating in the sovereign principle from the nutriment which is first and purest and fully concocted, those which are only necessary for the sake of the

former parts from the inferior nutriment and the residues left over from the other. For Nature, like a good householder, is not in the habit of throwing away anything from which it is possible to make anything useful. Now in a household the best part of the food that comes in is set apart for the free men, the inferior and the residue of the best for the slaves, and the worst is given to the animals that live with them. Just as the intellect acts thus in the outside world with a view to the growth of the persons concerned, so in the case of the embryo itself does Nature form from the purest material the flesh and the body of the other sense-organs, and from the residues thereof bones, sinews, hair, and also nails and hoofs and the like; hence these are last to assume their form, for they have to wait till the time when Nature has some residue to spare.

The bones, then, are made in the first conformation of the parts from the seminal secretion or residue. As the animal grows the bones grow from the natural nourishment, being the same as that of the sovereign parts, but of this they only take up the superfluous residues. For everywhere the nutriment may be divided into two kinds, the first and the second; the former is 'nutritious', being that which gives its essence both to the whole and to the parts; the latter is concerned with growth, being that which causes quantitative increase. But these must be distinguished more fully later on. The sinews are formed in the same way as the bones and out of the same materials, the Seminal and nutritious residue. Nails, hair, hoofs, horns, beaks, the spurs of cocks, and any other similar parts, are on the contrary formed from the nutriment which is taken later and only concerned with growth, in other words that which is derived from the mother, or from the outer world after birth. For this reason the bones on the one hand only grow up to a certain point (for there is a limit of size in all animals, and therefore also of the growth of the bones; if these had been always able to grow, all animals that have bone or its analogue would grow as

long as they lived, for these set the limit of size to animals. What is the reason of their not always increasing in size must be stated later.) Hair, on the contrary, and growths akin to hair go on growing as long as they exist at all, and increase yet more in diseases and when the body is getting old and wasting, because more residual matter is left over, as owing to old age and disease less is expended on the important parts, though when the residual matter also fails through age the hair fails with it. But the contrary is the case with the bones, for they waste away along with the body and the other parts. Hair actually goes on growing after death; it does not, however, begin growing then.

About the teeth a difficulty may be raised. They have actually the same nature as the bones, and are formed out of the bones, but nails, hair, horns, and the like are formed out of the skin, and that is why they change in colour along with it, for they become white, black, and all sorts of colours according to that of the skin. But the teeth do nothing of the sort, for they are made out of the bones in all animals that have both bones and teeth. Of all the bones they alone go on growing through life, as is plain with the teeth which grow out of the straight line so as no longer to touch each other. The reason for their growth, as a final cause, is their function, for they would soon be worn down if there were not some means of saving them; even as it is they are altogether worn down in old age in some animals which eat much and have not large teeth, their growth not being in proportion to their detrition. And so Nature has contrived well to meet the case in this also, for she causes the failure of the teeth to synchronize with old age and death. If life lasted for a thousand or ten thousand years the original teeth must have been very large indeed, and many sets of them must have been produced, for even if they had grown continuously they would still have been worn smooth and become useless for their work. The final cause of their growth has been now stated, but besides

this as a matter of fact the growth of the teeth is not the same as that of the other bones. The latter all come into being in the first formation of the embryo and none of them later, but the teeth do so later. Therefore it is possible for them to grow again after the first set falls out, for though they touch the bones they are not connate with them. They are formed, however, out of the nutriment distributed to the bones, and so have the same nature, even when the bones have their own number complete.

Other animals are born in possession of teeth or their analogue (unless in cases contrary to Nature), because when they are set free from the parent they are more perfect than man; but man (also unless in cases contrary to Nature) is born without them.

The reason will be stated later why some teeth are formed and fall out but others do not fall out.

It is because such parts are formed from a residue that man is the most naked in body of all animals and has the smallest nails in proportion to his size; he has the least amount of earthy residue, but that part of the blood which is not concocted is the residue, and the earthy part in the bodies of all animals is the least concocted. We have now stated how each of the parts is formed and what is the cause of their generation.

7

In viviparous animals, as said before, the embryo gets its growth through the umbilical cord. For since the nutritive power of the soul, as well as the others, is present in animals, it straightway sends off this cord like a root to the uterus. The cord consists of blood-vessels in a sheath, more numerous in the larger animals as cattle and the like, one in the smallest, two in those of

intermediate size. Through this cord the embryo receives its nourishment in the form of blood, for the uterus is the termination of many blood-vessels. All animals with no front teeth in the upper jaw, and all those which have them in both jaws and whose uterus has not one great blood-vessel running through it but many close together instead – all these have in the uterus the so-called cotyledons (with which the umbilical cord connects and is closely united; for the vessels which pass through the cord run backwards and forwards between embryo and uterus and split up into smaller vessels all over the uterus; where they terminate, there are found the cotyledons). Their convexity is turned towards the uterus, the concavity towards the embryo. Between uterus and embryo are the chorion and the membranes. As the embryo grows and approaches perfection the cotyledons become smaller and finally disappear when it is perfected. For Nature sends the sanguineous nutriment for the embryo into this part of the uterus as she sends milk into the breasts, and because the cotyledons are gradually aggregated from many into a few the body of the cotyledon becomes like an eruption or inflammation. So long as the embryo is comparatively small, being unable to receive much nutriment, they are plain and large, but when it has increased in size they fall in together.

But most of the animals which have front teeth in both jaws and no horns have no cotyledons in the uterus, but the umbilical cord runs to meet one blood-vessel, which is large and extends throughout the uterus. Of such animals some produce one young at a time, some more than one, but the same description applies to both these classes. (This should be studied with the aid of the examples drawn in the Anatomy and the Enquiries.) For the young, if numerous, are attached each to its umbilical cord, and this to the blood-vessel of the mother; they are arranged next to one another along the stream of the

blood-vessel as along a canal; and each embryo is enclosed in its membranes and chorion.

Those who say that children are nourished in the uterus by sucking some lump of flesh or other are mistaken. If so, the same would have been the case with other animals, but as it is we do not find this (and this can easily be observed by dissection). Secondly, all embryos alike, whether of creatures that fly or swim or walk, are surrounded by fine membranes separating them from the uterus and from the fluids which are formed in it; but neither in these themselves is there anything of the kind, nor is it possible for the embryo to take nourishment by means of any of them. Thirdly, it is plain that all creatures developed in eggs grow when separated from the uterus.

Natural intercourse takes place between animals of the same kind. However, those also unite whose nature is near akin and whose form is not very different, if their size is much the same and if the periods of gestation are equal. In other animals such cases are rare, but they occur with dogs and foxes and wolves; the Indian dogs also spring from the union of a dog with some wild dog-like animal. A similar thing has been seen to take place in those birds that are amative, as partridges and hens. Among birds of prey hawks of different form are thought to unite, and the same applies to some other birds. Nothing worth mentioning has been observed in the inhabitants of the sea, but the so-called 'rhinobates' especially is thought to spring from the union of the 'rhini' and 'batus'. And the proverb about Libya, that 'Libya is always producing something new', is said to have originated from animals of different species uniting with one another in that country, for it is said that because of the want of water all meet at the few places where springs are to be found, and that even different kinds unite in consequence.

Of the animals that arise from such union all except mules are found to copulate again with each other and to be able to produce young of both sexes, but mules alone are sterile, for they do not generate by union with one another or with other animals. The problem why any individual, whether male or female, is sterile is a general one, for some men and women are sterile, and so are other animals in their several kinds, as horses and sheep. But this kind, of mules, is universally so. The causes of sterility in other animals are several. Both men and women are sterile from birth when the parts useful for union are imperfect, so that men never grow a beard but remain like eunuchs, and women do not attain puberty; the same thing may befall others as their years advance, sometimes on account of the body being too well nourished (for men who are in too good condition and women who are too fat the seminal secretion is taken up into the body, and the former have no semen, the latter no catamenia); at other times by reason of sickness men emit the semen in a cold and liquid state, and the discharges of women are bad and full of morbid secretions. Often, too, in both sexes this state is caused by injuries in the parts and regions contributory to copulation. Some such cases are curable, others incurable, but the subjects especially remain sterile if anything of the sort has happened in the first formation of the parts in the embryo, for then are produced women of a masculine and men of a feminine appearance, and in the former the catamenia do not occur, in the latter the semen is thin and cold. Hence it is with good reason that the semen of men is tested in water to find out if it is infertile, for that which is thin and cold is quickly spread out on the surface, but the fertile sinks to the bottom, for that which is well concocted is hot indeed, but that which is firm and thick is well concocted. They test women by pessaries to see if the smells thereof permeate from below upwards to the breath from the mouth and by colours smeared upon the eyes to see if they colour the saliva. If these results do not follow it is

a sign that the passages of the body, through which the catamenia are secreted, are clogged and closed. For the region about the eyes is, of all the head, that most nearly connected with the generative secretions; a proof of this is that it alone is visibly changed in sexual intercourse, and those who indulge too much in this are seen to have their eyes sunken in. The reason is that the nature of the semen is similar to that of the brain, for the material of it is watery (the heat being acquired later). And the seminal purgations are from the region of the diaphragm, for the first principle of nature is there, so that the movements from the pudenda are communicated to the chest, and the smells from the chest are perceived through the respiration.

8

In men, then, and in other kinds, as said before, such deficiency occurs sporadically, but the whole of the mule kind is sterile. The reason has not been rightly given by Empedocles and Democritus, of whom the former expresses himself obscurely, the latter more intelligibly. For they offer their demonstration in the case of all these animals alike which unite against their affinities. Democritus says that the genital passages of mules are spoilt in the mother's uterus because the animals from the first are not produced from parents of the same kind. But we find that though this is so with other animals they are none the less able to generate; yet, if this were the reason, all others that unite in this manner ought to be barren. Empedocles assigns as his reason that the mixture of the 'seeds' becomes dense, each of the two seminal fluids out of which it is made being soft, for the hollows in each fit into the densities of the other, and in such cases a hard substance is formed out of soft ones, like

bronze mingled with tin. Now he does not give the correct reason in the case of bronze and tin – (we have spoken of them in the Problems) – nor, to take general ground, does he take his principles from the intelligible. How do the 'hollows' and 'solids' fit into one another to make the mixing, e.g. in the case of wine and water? This saying is quite beyond us; for how we are to understand the 'hollows' of the wine and water is too far beyond our perception. Again, when, as a matter of fact, horse is born of horse, ass of ass, and mule of horse and ass in two ways according as the parents are stallion and she-ass or jackass and mare, why in the last case does there result something so 'dense' that the offspring is sterile, whereas the offspring of male and female horse, male and female ass, is not sterile? And yet the generative fluid of the male and female horse is soft. But both sexes of the horse cross with both sexes of the ass, and the offspring of both crosses are barren, according to Empedocles, because from both is produced something 'dense', the 'seeds' being 'soft'. If so, the offspring of stallion and mare ought also to be sterile. If one of them alone united with the ass, it might be said that the cause of the mule's being unable to generate was the unlikeness of that one to the generative fluid of the ass; but, as it is, whatever be the character of that generative fluid with which it unites in the ass, such it is also in the animal of its own kind. Then, again, the argument is intended to apply to both male and female mules alike, but the male does generate at seven years of age, it is said; it is the female alone that is entirely sterile, and even she is so only because she does not complete the development of the embryo, for a female mule has been known to conceive.

Perhaps an abstract proof might appear to be more plausible than those already given; I call it abstract because the more general it is the further is it removed from the special principles involved. It runs somewhat as follows. From male and female of the same species there are born in course of nature male and

female of the same species as the parents, e.g. male and female puppies from male and female dog. From parents of different species is born a young one different in species; thus if a dog is different from a lion, the offspring of male dog and lioness or of lion and bitch will be different from both parents. If this is so, then since (1) mules are produced of both sexes and are not different in species from one another, and (2) a mule is born of horse and ass and these are different in species from mules, it is impossible that anything should be produced from mules. For (1) another kind cannot be, because the product of male and female of the same species is also of the same species, and (2) a mule cannot be, because that is the product of horse and ass which are different in form, [and it was laid down that from parents different in form is born a different animal]. Now this theory is too general and empty. For all theories not based on the special principles involved are empty; they only appear to be connected with the facts without being so really. As geometrical arguments must start from geometrical principles, so it is with the others; that which is empty may seem to be something, but is really nothing. Now the basis of this particular theory is not true, for many animals of different species are fertile with one another, as was said before. So we must not inquire into questions of natural science in this fashion any more than any other questions; we shall be more likely to find the reason by considering the facts peculiar to the two kinds concerned, horse and ass. In the first place, each of them, if mated with its own kind, bears only one young one; secondly, the females are not always able to conceive from the male (wherefore breeders put the horse to the mare again at intervals). Indeed, both the mare is deficient in catamenia, discharging less than any other quadruped, and the she-ass does not admit the impregnation, but ejects the semen with her urine, wherefore men follow flogging her after intercourse. Again the ass is an animal of cold nature, and so is not wont to

be produced in wintry regions because it cannot bear cold, as in Scythia and the neighbouring country and among the Celts beyond Iberia, for this country also is cold. For this cause they do not put the jackasses to the females at the equinox, as they do with horses, but about the summer solstice, in order that the ass-foals may be born in a warm season, for the mothers bear at the same season as that in which they are impregnated, the period of gestation in both horse and ass being one year. The animal, then, being, as has been said of such a cold nature, its semen also must be cold. A proof of this is that if a horse mount a female already impregnated by an ass he does not destroy the impregnation of the ass, but if the ass be the second to mount her he does destroy that of the horse because of the coldness of his own semen. When, therefore, they unite with each other, the generative elements are preserved by the heat of the one of them, that contributed by the horse being the hotter; for in the ass both the semen of the male and the material contributed by the female are cold, and those of the horse, in both sexes, are hotter. Now when either hot is added to cold or cold to hot so as to mix, the result is that the embryo itself arising from these is preserved and thus these animals are fertile when crossed with one another, but the animal produced by them is no longer fertile but unable to produce perfect offspring.

And in general each of these animals naturally tends towards sterility. The ass has all the disadvantages already mentioned, and if it should not begin to generate after the first shedding of teeth, it no longer generates at all; so near is the constitution of the ass to being sterile. The horse is much the same; it tends naturally towards sterility, and to make it entirely so it is only necessary that its generative secretion should become colder; now this is what happens to it when mixed with the corresponding secretion of the ass. The ass in like manner comes very near generating a sterile animal when mated with its own species. Thus when the difficulty of a cross contrary to

nature is added, (when too even in the other case when united with their own species they with difficulty produce a single young one), the result of the cross, being still more sterile and contrary to nature, will need nothing further to make it sterile, but will be so of necessity.

We find also that the bodies of female mules grow large because the matter which is secreted in other animals to form the catamenia is diverted to growth. But since the period of gestation in such animals is a year, the mule must not only conceive, if she is to be fertile, but must also nourish the embryo till birth, and this is impossible if there are no catamenia. But there are none in the mule; the useless part of the nutriment is discharged with the excretion from the bladder – this is why male mules do not smell to the pudenda of the females, as do the other solid-hoofed ungulates, but only to the evacuation itself – and the rest of the nutriment is used up to increase the size of the body. Hence it is sometimes possible for the female to conceive, as has been known to happen before now, but it is impossible for her to complete the process of nourishing the embryo and bringing it to birth.

The male, again, may sometimes generate, both because the male sex is naturally hotter than the female and because it does not contribute any material substance to the mixture. The result in such cases is a 'ginnus', that is to say, a dwarf mule; for 'ginni' are produced also from the crossing of horse and ass when the embryo is diseased in the uterus. The ginnus is in fact like the so-called 'metachoera' in swine, for a 'metachoerum' also is a pig injured in the uterus; this may happen to any pig. The origin of human dwarfs is similar, for these also have their parts and their whole development injured during gestation, and resemble ginni and metachoera.

Book III

1

We have now spoken about the sterility of mules, and about those animals which are viviparous both externally and within themselves. The generation of the oviparous sanguinea is to a certain extent similar to that of the animals that walk, and all may be embraced in the same general statement; but in other respects there are differences in them both as compared with each other and with those that walk. All alike are generated from sexual union, the male emitting semen into the female. But among the ovipara (1) birds produce a perfect hard-shelled egg, unless it be injured by disease, and the eggs of birds are all two-coloured. (2) The cartilaginous fishes, as has been often said already, are oviparous internally but produce the young alive, the egg changing previously from one part of the uterus to another; and their egg is soft-shelled and of one colour. One of this class alone does not produce the young from the egg within itself, the so-called 'frog'; the reason of which must be stated later. (3) All other oviparous fishes produce an egg of one colour, but this is imperfect, for its growth is completed outside the mother's body by the same cause as are those eggs which are perfected within.

Concerning the uterus of these classes of animals, what differences there are among them and for what reasons, has been stated previously. For in some of the viviparous creatures it is high up near the hypozoma, in others low down by the

pudenda; the former in the cartilaginous fishes, the latter in animals both internally and externally viviparous, such as man and horse and the rest; in the ovipara it is sometimes low, as in the oviparous fish, and sometimes high, as in birds.

Some embryos are formed in birds spontaneously, which are called wind-eggs and 'zephyria' by some; these occur in birds which are not given to flight nor rapine but which produce many young, for these birds have much residual matter, whereas in the birds of prey all such secretion is diverted to the wings and wing-feathers, while the body is small and dry and hot. (The secretion corresponding in hen-birds to catamenia, and the semen of the cock, are residues.) Since then both the wings and the semen are made from residual matter, nature cannot afford to spend much upon both. And for this same reason the birds of prey are neither given to treading much nor to laying many eggs, as are the heavy birds and those flying birds whose bodies are bulky, as the pigeon and so forth. For such residual matter is secreted largely in the heavy birds not given to flying, such as fowls, partridges, and so on, wherefore their males tread often and their females produce much material. Of such birds some lay many eggs at a time and some lay often; for instance, the fowl, the partridge, and the Libyan ostrich lay many eggs, while the pigeon family do not lay many but lay often. For these are between the birds of prey and the heavy ones; they are flyers like the former, but have bulky bodies like the latter; hence, because they are flyers and the residue is diverted that. way, they lay few eggs, but they lay often because of their having bulky bodies and their stomachs being hot and very active in concoction, and because moreover they can easily procure their food, whereas the birds of prey do so with difficulty.

Small birds also tread often and are very fertile, as are sometimes small plants, for what causes bodily growth in

others turn in them to a seminal residuum. Hence the Adrianic fowls lay most eggs, for because of the smallness of their bodies the nutriment is used up in producing young. And other birds are more fertile than game-fowl, for their bodies are more fluid and bulkier, whereas those of game-fowl are leaner and drier, since a passionate spirit is found rather in such bodies as the latter. Moreover the thinness and weakness of the legs contribute to making the former class of birds naturally inclined to tread and to be fertile, as we find also in the human species; for the nourishment which otherwise goes to the legs is turned in such into a seminal secretion, what Nature takes from the one place being added at the other. Birds of prey, on the contrary, have a strong walk and their legs are thick owing to their habits, so that for all these reasons they neither tread nor lay much. The kestrel is the most fertile; for this is nearly the only bird of prey which drinks, and its moisture, both innate and acquired, along with its heat is favourable to generative products. Even this bird does not lay very many eggs, but four at the outside.

The cuckoo, though not a bird of prey, lays few eggs, because it is of a cold nature, as is shown by the cowardice of the bird, whereas a generative animal should be hot and moist. That it is cowardly is plain, for it is pursued by all the birds and lays eggs in the nests of others.

The pigeon family are in the habit of laying two for the most part, for they neither lay one (no bird does except the cuckoo, and even that sometimes lays two) nor yet many, but they frequently produce two, or three at the most generally two, for this number lies between one and many.

It is plain from the facts that with the birds that lay many eggs the nutriment is diverted to the semen. For most trees, if they bear too much fruit, wither away after the crop when nutriment

is not reserved for themselves, and this seems to be what happens to annuals, as leguminous plants, corn, and the like. For they consume all their nutriment to make seed, their kind being prolific. And some fowls after laying too much, so as even to lay two eggs in a day, have died after this. For both the birds the plants become exhausted, and this condition is an excess of secretion of residual matter. A similar condition is the cause of the later sterility of the lioness, for at the first birth she produces five or six, then in the next year four, and again three cubs, then the next number down to one, then none at all, showing that the residue is being used up and the generative secretion is failing along with the advance of years.

We have now stated in which birds wind-eggs are found, and also what sort of birds lay many eggs or few, and for what reasons. And wind-eggs, as said before, come into being because while it is the material for generation that exists in the female of all animals, birds have no discharge of catamenia like viviparous sanguinea (for they occur in all these latter, more in some, less in others, and in some only enough in quantity just to mark the class). The same applies to fish as to birds, and so in them as in birds is found an embryonic formation without impregnation, but it is less obvious because their nature is colder. The secretion corresponding to the catamenia of vivipara is formed in birds at the appropriate season for the discharge of superfluous matter, and, because the region near the hypozoma is hot, it is perfected so far as size is concerned, but in birds and fishes alike it is imperfect for generation without the seminal fluid of the male; the cause of this has been previously given. Wind-eggs are not formed in the flying birds, for the same reason as prevents their laying many eggs; for the residual matter in birds of prey is small, and they need the male to give an impulse for the discharge of it. The wind-eggs are produced in greater numbers than the impregnated but smaller in size for one and the same reason; they are smaller in size because they

are imperfect, and because they are smaller in size they are more in number. They are less pleasant for food because they are less concocted, for in all foods the concocted is more agreeable. It has been sufficiently observed, then, that neither birds' nor fishes' eggs are perfected for generation without the males. As for embryos being formed in fish also (though in a less degree) without the males, the fact has been observed especially in river fish, for some are seen to have eggs from the first, as has been written in the Enquiries concerning them. And generally speaking in the case of birds even the impregnated eggs are not wont for the most part to attain their full growth unless the hen be trodden continually. The reason of this is that just as with women intercourse with men draws down the secretion of the catamenia (for the uterus being heated attracts the moisture and the passages are opened), so this happens also with birds; the residual matter corresponding to the catamenia advances a little at a time, and is not discharged externally, because its amount is small and the uterus is high up by the hypozoma, but trickles together into the uterus itself. For as the embryo of the vivipara grows by means of the umbilical cord, so the egg grows through this matter flowing to it through the uterus. For when once the hens have been trodden, they all continue to have eggs almost without intermission, though very small ones. Hence some are wont to speak of wind-eggs as not coming into being independently but as mere relics from a previous impregnation. But this is a false view, for sufficient observations have been made of their arising without impregnation in chickens and goslings. Also the female partridges which are taken out to act as decoys, whether they have ever been impregnated or not, immediately on smelling the male and hearing his call, become filled with eggs in the latter case and lay them in the former. The reason why this happens is the same as in men and quadrupeds, for if their bodies chance to be in rut they emit semen at the mere sight of

the female or at a slight touch. And such birds are of a lascivious and fertile nature, so that the impulse they need is but small when they are in this excited condition, and the secreting activity takes place quickly in them, wind-eggs forming in the unimpregnated and the eggs in those which have been impregnated growing and reaching perfection swiftly.

Among creatures that lay eggs externally birds produce their egg perfect, fish imperfect, but the eggs of the latter complete their growth outside as has been said before. The reason is that the fish kind is very fertile; now it is impossible for many eggs to reach completion within the mother and therefore they lay them outside. They are quickly discharged, for the uterus of externally oviparous fishes is near the generative passage. While the eggs of birds are two-coloured, those of all fish are one-coloured. The cause of the double colour may be seen from considering the power of each of the two parts, the white and the yolk. For the matter of the egg is secreted from the blood [No bloodless animal lays eggs,] and that the blood is the material of the body has been often said already. The one part, then, of the egg is nearer the form of the animal coming into being, that is the hot part; the more earthy part gives the substance of the body and is further removed. Hence in all two-coloured eggs the animal receives the first principle of generation from the white (for the vital principle is in that which is hot), but the nutriment from the yolk. Now in animals of a hotter nature the part from which the first principle arises is separated off from the part from which comes the nutriment, the one being white and the other yellow, and the white and pure is always more than the yellow and earthy; but in the moister and less hot the yolk is more in quantity and more fluid. This is what we find in lake birds, for they are of a moister nature and are colder than the land birds, so that the so-called 'lecithus' or yolk in the eggs of such birds is large and less yellow because the white is less separated off from it. But when

we come to the ovipara which are both of a cold nature and also moister (such is the fish kind) we find the white not separated at all because of the small size of the eggs and the quantity of the cold and earthy matter; therefore all fish eggs are of one colour, and white compared with yellow, yellow compared with white. Even the wind-eggs of birds have this distinction of colour, for they contain that out of which will come each of the two parts, alike that whence arises the principle of life and that whence comes the nutriment; only both these are imperfect and need the influence of the male in addition; for wind-eggs become fertile if impregnated by the male within a certain period. The difference in colour, however, is not due to any difference of sex, as if the white came from the male, the yolk from the female; both on the contrary come from the female, but the one is cold, the other hot. In all cases then where the hot part is considerable it is separated off, but where it is little it cannot be so; hence the eggs of such animals, as has been said, are of one colour. The semen of the male only puts them into form; and therefore at first the egg in birds appears white and small, but as it advances it is all yellow as more of the sanguineous material is continually mixed with it; finally as the hot part is separated the white takes up a position all round it and equally distributed on all sides, as when a liquid boils; for the white is naturally liquid and contains in itself the vital heat; therefore it is separated off all round, but the yellow and earthy part is inside. And if we enclose many eggs together in a bladder or something of the kind and boil them over a fire so as not to make the movement of the heat quicker than the separation of the white and yolk in the eggs, then the same process takes place in the whole mass of the eggs as in a single egg, all the yellow part coming into the middle and the white surrounding it.

We have thus stated why some eggs are of one colour and others of two.

2

The principle of the male is separated off in eggs at the point where the egg is attached to the uterus, and the reason why the shape of two-coloured eggs is unsymmetrical, and not perfectly round but sharper at one end, is that the part of the white in which is contained this principle must differ from the rest. Therefore the egg is harder at this point than below, for it is necessary to shelter and protect this principle. And this is why the sharp end of the egg comes out of the hen later than the blunt end; for the part attached to the uterus comes out later, and the egg is attached at the point where is the said principle, and the principle is in the sharp end. The same is the case also in the seeds of plants; the principle of the seed is attached sometimes to the twig, sometimes to the husk, sometimes to the pericarp. This is plain in the leguminous plants, for where the two cotyledons of beans and of similar seeds are united, there is the seed attached to the parent plant, and there is the principle of the seed.

A difficulty may be raised about the growth of the egg; how is it derived from the uterus? For if animals derive their nutriment through the umbilical cord, through what do eggs derive it? They do not, like a scolex, acquire their growth by their own means. If there is anything by which they are attached to the uterus, what becomes of this when the egg is perfected? It does not come out with the egg as the cord does with animals; for when its egg is perfected the shell forms all round it. This problem is rightly raised, but it is not observed that the shell is at first only a soft membrane, and that it is only after the egg is perfected that it becomes hard and brittle; this is so nicely adjusted that it is still soft when it comes out (for otherwise it

would cause pain in laying), but no sooner has it come out than it is fixed hard by cooling, the moisture quickly evaporating because there is but little of it, and the earthy part remaining. Now at first a certain part of this membrane at the sharp end of eggs resembles an umbilical cord, and projects like a pipe from them while they are still small. It is plainly visible in small aborted eggs, for if the bird be drenched with water or suddenly chilled in any other way and cast out the egg too soon, it appears still sanguineous and with a small tail like an umbilical cord running through it. As the egg becomes larger this is more twisted round and becomes smaller, and when the egg is perfected this end is the sharp end. Under this is the inner membrane which separates the white and the yolk from this. When the egg is perfected, the whole of it is set free, and naturally the umbilical cord does not appear, for it is now the extreme end of the egg itself.

The egg is discharged in the opposite way from the young of vivipara; the latter are born head-first, the part where is the first principle leading, but the egg is discharged as it were feet first; the reason of this being what has been stated, that the egg is attached to the uterus at the point where is the first principle.

The young bird is produced out of the egg by the mother's incubating and aiding the concoction, the creature developing out of part of the egg, and receiving growth and completion from the remaining part. For Nature not only places the material of the creature in the egg but also the nourishment sufficient for its growth; for since the mother bird cannot perfect her young within herself she produces the nourishment in the egg along with it. Whereas the nourishment, what is called milk, is produced for the young of vivipara in another part, in the breasts, Nature does this for birds in the egg. The opposite, however, is the case to what people think and what is asserted by Alcmaeon of Crotona. For it is not the white that is

the milk, but the yolk, for it is this that is the nourishment of the chick, whereas they think it is the white because of the similarity of colour.

The chick then, as has been said, comes into being by the incubation of the mother; yet if the temperature of the season is favourable, or if the place in which the eggs happen to lie is warm, the eggs are sufficiently concocted without incubation, both those of birds and those of oviparous quadrupeds. For these all lay their eggs upon the ground, where they are concocted by the heat in the earth. Such oviparous quadrupeds as do visit their eggs and incubate do so rather for the sake of protecting them than of incubation.

The eggs of these quadrupeds are formed in the same way as those of birds, for they are hard-shelled and two-coloured, and they are formed near the hypozoma as are those of birds, and in all other respects resemble them both internally and externally, so that the inquiry into their causes is the same for all. But whereas the eggs of quadrupeds are hatched out by the mere heat of the weather owing to their strength, those of birds are more exposed to destruction and need the mother-bird. Nature seems to wish to implant in animals a special sense of care for their young: in the inferior animals this lasts only to the moment of giving birth to the incompletely developed animal; in others it continues till they are perfect; in all that are more intelligent, during the bringing up of the young also. In those which have the greatest portion in intelligence we find familiarity and love shown also towards the young when perfected, as with men and some quadrupeds; with birds we find it till they have produced and brought up their young, and therefore if the hens do not incubate after laying they get into worse condition, as if deprived of something natural to them.

The young is perfected within the egg more quickly in sunshiny weather, the season aiding in the work, for concoction is a kind of heat. For the earth aids in the concoction by its heat, and the brooding hen does the same, for she applies the heat that is within her. And it is in the hot season, as we should expect, that the eggs are more apt to be spoilt and the so-called 'uria' or rotten eggs are produced; for just as wines turn sour in the heats from the sediment rising (for this is the cause of their being spoilt), so is it with the yolk in eggs, for the sediment and yolk are the earthy part in each case, wherefore the wine becomes turbid when the sediment mixes with it, and the like applies to the eggs that are spoiling because of the yolk. It is natural then that such should be the case with the birds that lay many eggs, for it is not easy to give the fitting amount of heat to all, but (while some have too little) others have too much and this makes them turbid, as it were by putrefaction. But this happens none the less with the birds of prey though they lay few eggs, for often one of the two becomes rotten, and the third practically always, for being of a hot nature they make the moisture in the eggs to overboil so to say. For the nature of the white is opposed to that of the yolk; the yolk congeals in frosts but liquefies on heating, and therefore it liquefies on concoction in the earth or by reason of incubation, and becoming liquid serves as nutriment for the developing chick. If exposed to heat and roasted it does not become hard, because though earthy in nature it is only so in the same way as wax is; accordingly on heating too much the eggs become watery and rotten, [if they be not from a liquid residue]. The white on the contrary is not congealed by frost but rather liquefies (the reason of which has been stated before), but on exposure to heat becomes solid. Therefore being concocted in the development of the chick it is thickened. For it is from this that the young is formed (whereas the yolk turns to nutriment) and it is from this that the parts derive their growth as they are formed one after another. This is

why the white and the yolk are separated by membranes, as being different in nature. The precise details of the relation of the parts to one another both at the beginning of generation and as the animals are forming, and also the details of the membranes and umbilical cords, must be learnt from what has been written in the Enquiries; for the present investigation it is sufficient to understand this much clearly, that, when the heart has been first formed and the great blood-vessel has been marked off from it, two umbilical cords run from the vessel, the one to the membrane which encloses the yolk, the other to the membrane resembling a chorion which surrounds the whole embryo; this latter runs round on the inside of the membrane of the shell. Through the one of these the embryo receives the nutriment from the yolk, and the yolk becomes larger, for it becomes more liquid by heating. This is because the nourishment, being of a material character in its first form, must become liquid before it can be absorbed, just as it is with plants, and at first this embryo, whether in an egg or in the mother's uterus, lives the life of a plant, for it receives its first growth and nourishment by being attached to something else.

The second umbilical cord runs to the surrounding chorion. For we must understand that, in the case of animals developed in eggs, the chick has the same relation to the yolk as the embryo of the vivipara has to the mother so long as it is within the mother (for since the nourishment of the embryo of the ovipara is not completed within the mother, the embryo takes part of it away from her). So also the relation of the chick to the outermost membrane, the sanguineous one, is like that of the mammalian embryo to the uterus. At the same time the egg-shell surrounds both the yolk and the membrane analogous to the uterus, just as if it should be put round both the embryo itself and the whole of the mother, in the vivipara. This is so because the embryo must be in the uterus and attached to the mother. Now in the vivipara the uterus is within the mother, but

in the ovipara it is the other way about, as if one should say that the mother was in the uterus, for that which comes from the mother, the nutriment, is the yolk. The reason is that the process of nourishment is not completed within the mother.

As the creature grows the umbilicus running the chorion collapses first, because it is here that the young is to come out; what is left of the yolk, and the umbilical cord running to the yolk, collapse later. For the young must have nourishment as soon as it is hatched; it is not nursed by the mother and cannot immediately procure its nourishment for itself; therefore the yolk enters within it along with its umbilicus and the flesh grows round it.

This then is the manner in which animals produced from perfect eggs are hatched in all those, whether birds or quadrupeds, which lay the egg with a hard shell. These details are plainer in the larger creatures; in the smaller they are obscure because of the smallness of the masses concerned.

3

The class of fishes is also oviparous. Those among them which have the uterus low down lay an imperfect egg for the reason previously given, but the so-called 'selache' or cartilaginous fishes produce a perfect egg within themselves but are externally viviparous except one which they call the 'frog'; this alone lays a perfect egg externally. The reason is the nature of its body, for its head is many times as large as the rest of the body and is spiny and very rough. This is also why it does not receive its young again within itself nor produce them alive to begin with, for as the size and roughness of the head prevents their entering so it would prevent their exit. And while the egg

of the cartilaginous fishes is soft-shelled (for they cannot harden and dry its circumference, being colder than birds), the egg of the frog-fish alone is solid and firm to protect it outside, but those of the rest are of a moist and soft nature, for they are sheltered within and by the body of the mother.

The young are produced from the egg in the same way both with those externally perfected (the frog-fishes) and those internally, and the process in these eggs is partly similar to, partly different from that in birds' eggs. In the first place they have not the second umbilicus which runs to the chorion under the surrounding shell. The reason of this is that they have not the surrounding shell, for it is no use to them since the mother shelters them, and the shell is a protection to the eggs against external injury between laying and hatching out. Secondly, the process in these also begins on the surface of the egg but not where it is attached to the uterus, as in birds, for the chick is developed from the sharp end and that is where the egg was attached. The reason is that the egg of birds is separated from the uterus before it is perfected, but in most though not all cartilaginous fishes the egg is still attached to the uterus when perfect. While the young develops upon the surface the egg is consumed by it just as in birds and the other animals detached from the uterus, and at last the umbilicus of the now perfect fish is left attached to the uterus. The like is the case with all those whose eggs are detached from the uterus, for in some of them the egg is so detached when it is perfect.

The question may be asked why the development of birds and cartilaginous fishes differs in this respect. The reason is that in birds the white and yolk are separate, but fish eggs are one-coloured, the corresponding matter being completely mixed, so that there is nothing to stop the first principle being at the opposite end, for the egg is of the same nature both at the point of attachment and at the opposite end, and it is easy to draw

the nourishment from the uterus by passages running from this principle. This is plain in the eggs which are not detached, for in some of the cartilaginous fish the egg is not detached from the uterus, but is still connected with it as it comes downwards with a view to the production of the young alive; in these the young fish when perfected is still connected by the umbilicus to the uterus when the egg has been consumed. From this it is clear that previously also, while the egg was still round the young, the passages ran to the uterus. This happens as we have said in the 'smooth hound'.

In these respects and for the reasons given the development of cartilaginous fishes differs from that of birds, but otherwise it takes place in the same way. For they have the one umbilicus in like manner as that of birds connecting with the yolk, – only in these fishes it connects with the whole egg (for it is not divided into white and yolk but all one-coloured), – and get their nourishment from this, and as it is being consumed the flesh in like manner encroaches upon and grows round it.

Such is the process of development in those fish that produce a perfect egg within themselves but are externally viviparous.

4

Most of the other fish are externally oviparous, all laying an imperfect egg except the frog-fish; the reason of this exception has been previously stated, and the reason also why the others lay imperfect eggs. In these also the development from the egg runs on the same lines as that of the cartilaginous and internally oviparous fishes, except that the growth is quick and from small beginnings and the outside of the egg is harder. The growth of the egg is like that of a scolex, for those animals

which produce a scolex give birth to a small thing at first and this grows by itself and not through any attachment to the parent. The reason is similar to that of the growth of yeast, for yeast also grows great from a small beginning as the more solid part liquefies and the liquid is aerated. This is effected in animals by the nature of the vital heat, in yeasts by the heat of the juice commingled with them. The eggs then grow of necessity through this cause (for they have in them superfluous yeasty matter), but also for the sake of a final cause, for it is impossible for them to attain their whole growth in the uterus because these animals have so many eggs. Therefore are they very small when set free and grow quickly, small because the uterus is narrow for the multitude of the eggs, and growing quickly that the race may not perish, as it would if much of the time required for the whole development were spent in this growth; even as it is most of those laid are destroyed before hatching. Hence the class of fish is prolific, for Nature makes up for the destruction by numbers. Some fish actually burst because of the size of the eggs, as the fish called 'belone', for its eggs are large instead of numerous, what Nature has taken away in number being added in size.

So much for the growth of such eggs and its reason.

5

A proof that these fish also are oviparous is the fact that even viviparous fish, such as the cartilaginous, are first internally oviparous, for hence it is plain that the whole class of fishes is oviparous. Where, however, both sexes exist and the eggs are produced in consequence of impregnation, the eggs do not arrive at completion unless the male sprinkle his milt upon

them. Some erroneously assert that all fish are female except in the cartilaginous fishes, for they think that the females of fish differ from what are supposed to be males only in the same way as in those plants where the one bears fruit but the other is fruitless, as olive and oleaster, fig and caprifig. They think the like applies to fish except the cartilaginous, for they do not dispute the sexes in these. And yet there is no difference in the males of cartilaginous fishes and those belonging to the oviparous class in respect of the organs for the milt, and it is manifest that semen can be squeezed out of males of both classes at the right season. The female also has a uterus. But if the whole class were females and some of them unproductive (as with mules in the class of bushy-tailed animals), then not only should those which lay eggs have a uterus but also the others, only the uterus of the latter should be different from that of the former. But, as it is, some of them have organs for milt and others have a uterus, and this distinction obtains in all except two, the erythrinus and the channa, some of them having the milt organs, others a uterus. The difficulty which drives some thinkers to this conclusion is easily solved if we look at the facts. They say quite correctly that no animal which copulates produces many young, for of all those that generate from themselves perfect animals or perfect eggs none is prolific on the same scale as the oviparous fishes, for the number of eggs in these is enormous. But they had overlooked the fact that fish-eggs differ from those of birds in one circumstance. Birds and all oviparous quadrupeds, and any of the cartilaginous fish that are oviparous, produce a perfect egg, and it does not increase outside of them, whereas the eggs of fish are imperfect and do so complete their growth. Moreover the same thing applies to cephalopods also and crustacea, yet these animals are actually seen copulating, for their union lasts a long time, and it is plain in these cases that the one is male and the other has a uterus. Finally, it would be strange if this distinction did

not exist in the whole class, just as male and female in all the vivipara. The cause of the ignorance of those who make this statement is that the differences in the copulation and generation of various animals are of all kinds and not obvious, and so, speculating on a small induction, they think the same must hold good in all cases.

So also those who assert that conception in female fishes is caused by their swallowing the semen of the male have not observed certain points when they say this. For the males have their milt and the females their eggs at about the same time of year, and the nearer the female is to laying the more abundant and the more liquid is the milt formed in the male. And just as the increase of the milt in the male and of the roe in the female takes place at the same time, so is it also with their emission, for neither do the females lay all their eggs together, but gradually, nor do the males emit all the milt at once. All these facts are in accordance with reason. For just as the class of birds in some cases has eggs without impregnation, but few and seldom, impregnation being generally required, so we find the same thing, though to a less degree, in fish. But in both classes these spontaneous eggs are infertile unless the male, in those kinds where the male exists, shed his fluid upon them. Now in birds this must take place while the eggs are still within the mother, because they are perfect when discharged, but in fish, because the eggs are imperfect and complete their growth outside the mother in all cases, those outside are preserved by the sprinkling of the milt over them, even if they come into being by impregnation, and here it is that the milt of the males is used up. Therefore it comes down the ducts and diminishes in quantity at the same time as this happens to the eggs of the females, for the males always attend them, shedding their milt upon the eggs as they are laid. Thus then they are male and female, and all of them copulate (unless in any kind the

distinction of sex does not exist), and without the semen of the male no such animal comes into being.

What helps in the deception is also the fact that the union of such fishes is brief, so that it is not observed even by many of the fishermen, for none of them ever watches anything of the sort for the sake of knowledge. Nevertheless their copulation has been seen, for fish [when the tail part does not prevent it] copulate like the dolphins by throwing themselves alongside of one another. But the dolphins take longer to get free again, whereas such fishes do so quickly. Hence, not seeing this, but seeing the swallowing of the milt and the eggs, even the fishermen repeat the same simple tale, so much noised abroad, as Herodotus the storyteller, as if fish were conceived by the mother's swallowing the milt, – not considering that this is impossible. For the passage which enters by way of the mouth runs to the intestines, not to the uterus, and what goes into the intestines must be turned into nutriment, for it is concocted; the uterus, however, is plainly full of eggs, and from whence did they enter it?

6

A similar story is told also of the generation of birds. For there are some who say that the raven and the ibis unite at the mouth, and among quadrupeds that the weasel brings forth its young by the mouth; so say Anaxagoras and some of the other physicists, speaking too superficially and without consideration. Concerning the birds, they are deceived by a false reasoning, because the copulation of ravens is seldom seen, but they are often seen uniting with one another with their beaks, as do all the birds of the raven family; this is plain with domesticated

jackdaws. Birds of the pigeon kind do the same, but, because they also plainly copulate, therefore they have not had the same legend told of them. But the raven family is not amorous, for they are birds that produce few young, though this bird also has been seen copulating before now. It is a strange thing, however, that these theorists do not ask themselves how the semen enters the uterus through the intestine, which always concocts whatever comes into it, as the nutriment; and these birds have a uterus like others, and eggs are found them near the hypozoma. And the weasel has a uterus in like manner to the other quadrupeds; by what passage is the embryo to get from it to the mouth? But this opinion has arisen because the young of the weasel are very small like those of the other fissipeds, of which we shall speak later, and because they often carry the young about in their mouths.

Much deceived also are those who make a foolish statement about the trochus and the hyena. Many say that the hyena, and Herodorus the Heracleot says that the trochus, has two pudenda, those of the male and of the female, and that the trochus impregnates itself but the hyena mounts and is mounted in alternate years. This is untrue, for the hyena has been seen to have only one pudendum, there being no lack of opportunity for observation in some districts, but hyenas have under the tail a line like the pudendum of the female. Both male and female have such a mark, but the males are taken more frequently; this casual observation has given rise to this opinion. But enough has been said of this.

7

Touching the generation of fish, the question may be raised, why it is that in the cartilaginous fish neither the females are seen discharging their eggs nor the males their milt, whereas in the non-viviparous fishes this is seen in both sexes. The reason is that the whole cartilaginous class do not produce much semen, and further the females have their uterus near hypozoma. For the males and females of the one class of fish differ from the males and females of the other class in like manner, for the cartilaginous are less productive of semen. But in the oviparous fish, as the females lay their eggs on account of their number, so do the males shed their milt on account of its abundance. For they have more milt than just what is required for copulation, as Nature prefers to expend the milt in helping to perfect the eggs, when the female has deposited them, rather than in forming them at first. For as has been said both further back and in our recent discussions, the eggs of birds are perfected internally but those of fish externally. The latter, indeed, resemble in a way those animals which produce a scolex, for the product discharged by them is still more imperfect than a fish's egg. It is the male that brings about the perfection of the egg both of birds and of fishes, only in the former internally, as they are perfected internally, and in the latter externally, because the egg is imperfect when deposited; but the result is the same in both cases.

In birds the wind-eggs become fertile, and those previously impregnated by one kind of cock change their nature to that of the later cock. And if the eggs be behindhand in growth, then, if the same cock treads the hen again after leaving off treading for a time, he causes them to increase quickly, not, however, at any period whatever of their development, but if the treading take place before the egg changes so far that the white begins to separate from the yolk. But in the eggs of fishes no such limit of

time has been laid down, but the males shed their milt quickly upon them to preserve them. The reason is that these eggs are not two-coloured, and hence there is no such limit of time fixed with them as with those of birds. This fact is what we should expect, for by the time that the white and yolk are separated off from one another, the birds egg already contains the principle that comes from the male parent.... for the male contributes to this.

Wind-eggs, then, participate in generation so far as is possible for them. That they should be perfected into an animal is impossible, for an animal requires sense-perception; but the nutritive faculty of the soul is possessed by females as well as males, and indeed by all living things, as has been often said, wherefore the egg itself is perfect only as the embryo of a plant, but imperfect as that of an animal. If, then, there had been no male sex in the class of birds, the egg would have been produced as it is in some fishes, if indeed there is any kind of fish of such a nature as to generate without a male; but it has been said of them before that this has not yet been satisfactorily observed. But as it is both sexes exist in all birds, so that, considered as a plant, the egg is perfect, but in so far as it is not a plant it is not perfect, nor does anything else result from it; for neither has it come into being simply like a real plant nor from copulation like an animal. Eggs, however, produced from copulation but already separated into white and yolk take after the first cock; for they already contain both principles, which is why they do not change again after the second impregnation.

8

The young are produced in the same way also by the cephalopoda, e.g. sepias and the like, and by the crustacea, e.g. carabi and their kindred, for these also lay eggs in consequence of copulation, and the male has often been seen uniting with the female. Therefore those who say that all fish are female and lay eggs without copulation are plainly speaking unscientifically from this point of view also. For it is a wonderful thing to suppose that the former animals lay eggs in consequence of copulation and that fish do not; if again they were unaware of this, it is a sign of ignorance. The union of all these creatures lasts a considerable time, as in insects, and naturally so, for they are bloodless and therefore of a cold nature.

In the sepias and calamaries or squids the eggs appear to be two, because the uterus is divided and appears double, but that of the poulps appears to be single. The reason is that the shape of the uterus in the poulp is round in form and spherical, the cleavage being obscure when it is filled with eggs. The uterus of the carabi is also bifid. All these animals also lay an imperfect egg for the same reason as fishes. In the carabi and their like the females produce their eggs so as to keep them attached to themselves, which is why the side-flaps of the females are larger than those of the males, to protect the eggs; the cephalopoda lay them away from themselves. The males of the cephalopoda sprinkle their milt over the females, as the male fish do over the eggs, and it becomes a sticky and glutinous mass, but in the carabi and their like nothing of the sort has been seen or can be naturally expected, for the egg is under the female and is hard-shelled. Both these eggs and those of the cephalopoda grow after deposition like those of fishes.

The sepia while developing is attached to the egg by its front part, for here alone is it possible, because this animal alone has

its front and back pointing in the same direction. For the position and attitude of the young while developing you must look at the Enquiries.

9

We have now spoken of the generation of other animals, those that walk, fly, and swim; it remains to speak of insects and testacea according to the plan laid down. Let us begin with the insects. It was observed previously that some of these are generated by copulation, others spontaneously, and besides this that they produce a scolex, and why this is so. For pretty much all creatures seem in a certain way to produce a scolex first, since the most imperfect embryo is of such a nature; and in all animals, even the viviparous and those that lay a perfect egg, the first embryo grows in size while still undifferentiated into parts; now such is the nature of the scolex. After this stage some of the ovipara produce the egg in a perfect condition, others in an imperfect, but it is perfected outside as has been often stated of fish. With animals internally viviparous the embryo becomes egg-like in a certain sense after its original formation, for the liquid is contained in a fine membrane, just as if we should take away the shell of the egg, wherefore they call the abortion of an embryo at that stage an 'efflux'.

Those insects which generate at all generate a scolex, and those which come into being spontaneously and not from copulation do so at first from a formation this nature. I say that the former generate a scolex, for we must put down caterpillars also and the product of spiders as a sort of scolex. And yet some even of these and many of the others may be thought to resemble eggs because of their round shape, but we must not judge by shapes

nor yet by softness and hardness (for what is produced by some is hard), but by the fact that the whole of them is changed into the body of the creature and the animal is not developed from a part of them. All these products that are of the nature of a scolex, after progressing and acquiring their full size, become a sort of egg, for the husk about them hardens and they are motionless during this period. This is plain in the scolex of bees and wasps and in caterpillars. The reason of this is that their nature, because of its imperfection, oviposits as it were before the right time, as if the scolex, while still growing in size, were a soft egg. Similar to this is also what happens with all other insects which come into being without copulation in wool and other such materials and in water. For all of them after the scolex stage become immovable and their integument dries round them, and after this the latter bursts and there comes forth as from an egg an animal perfected in its second metamorphosis, most of those which are not aquatic being winged.

Another point is quite natural, which may wondered at by many. Caterpillars at first take nourishment, but after this stage do so no longer, but what is called by some the chrysalis is motionless. The same applies to the scolex of wasps and bees, but after this comes into being the so-called nymph.... and have nothing of the kind. For an egg is also of such a nature that when it has reached perfection it grows no more in size, but at first it grows and receives nourishment until it is differentiated and becomes a perfect egg. Sometimes the scolex contains in itself the material from which it is nourished and obtains such an addition to its size, e.g. in bees and wasps; sometimes it gets its nourishment from outside itself, as caterpillars and some others.

It has thus been stated why such animals go through a double development and for what reason they become immovable

again after moving. And some of them come into being by copulation, like birds and vivipara and most fishes, others spontaneously, like some plants.

10

There is much difficulty about the generation of bees. If it is really true that in the case of some fishes there is such a method of generation that they produce eggs without copulation, this may well happen also with bees, to judge from appearances. For they must (1) either bring the young brood from elsewhere, as some say, and if so the young must either be spontaneously generated or produced by some other animal, or (2) they must generate them themselves, or (3) they must bring some and generate others, for this also is maintained by some, who say that they bring the young of the drones only. Again, if they generate them it must be either with or without copulation; if the former, then either (1) each kind must generate its own kind, or (2) some one kind must generate the others, or (3) one kind must unite with another for the purpose (I mean for instance (1) that bees may be generated from the union of bees, drones from that of drones, and kings from that of kings, or (2) that all the others may be generated from one, as from what are called kings and leaders, or (3) from the union of drones and bees, for some say that the former are male, the latter female, while others say that the bees are male and the drones female). But all these views are impossible if we reason first upon the facts peculiar to bees and secondly upon those which apply more generally to other animals also.

For if they do not generate the young but bring them from elsewhere, then bees ought to come into being also, if the bees

did not carry them off, in the places from which the old bees carry the germs. For why, if new bees come into existence when the germs are transported, should they not do so if the germs are left there? They ought to do so just as much, whether the germs are spontaneously generated in the flowers or whether some animal generates them. And if the germs were of some other animal, then that animal ought to be produced from them instead of bees. Again, that they should collect honey is reasonable, for it is their food, but it is strange that they should collect the young if they are neither their own offspring nor food. With what object should they do so? for all animals that trouble themselves about the young labour for what appears to be their own offspring.

But, again, it is also unreasonable to suppose that the bees are female and the drones male, for Nature does not give weapons for fighting to any female, and while the drones are stingless all the bees have a sting. Nor is the opposite view reasonable, that the bees are male and the drones female, for no males are in the habit of working for their offspring, but as it is the bees do this. And generally, since the brood of the drones is found coming into being among them even if there is no mature drone present, but that of the bees is not so found without the presence of the kings (which is why some say that the young of the drones alone is brought in from outside), it is plain that they are not produced from copulation, either (1) of bee with bee or drone with drone or (2) of bees with drones. (That they should import the brood of the drones alone is impossible for the reasons already given, and besides it is unreasonable that a similar state of things should not prevail with all the three kinds if it prevails with one.) Then, again, it is also impossible that the bees themselves should be some of them male and some female, for in all kinds of animals the two sexes differ. Besides they would in that case generate their own kind, but as it is their brood is not found to come into being if the leaders

are not among them, as men say. And an argument against both theories, that the young are generated by union of the bees with one another or with the drones, separately or with one another, is this: none of them has ever yet been seen copulating, whereas this would have often happened if the sexes had existed in them. It remains then, if they are generated by copulation at all, that the kings shall unite to generate them. But the drones are found to come into being even if no leaders are present, and it is not possible that the bees should either import their brood or themselves generate them by copulation. It remains then, as appears to be the case in certain fishes, that the bees should generate the drones without copulation, being indeed female in respect of generative power, but containing in themselves both sexes as plants do. Hence also they have the instrument of offence, for we ought not to call that female in which the male sex is not separated. But if this is found to be the case with drones, if they come into being without copulation, then as it is necessary that the same account should be given of the bees and the kings and that they also should be generated without copulation. Now if the brood of the bees had been found to come into being among them without the presence of the kings, it would necessarily follow that the bees also are produced from bees themselves without copulation, but as it is, since those occupied with the tendance of these creatures deny this, it remains that the kings must generate both their own kind and the bees.

As bees are a peculiar and extraordinary kind of animal so also their generation appears to be peculiar. That bees should generate without copulation is a thing which may be paralleled in other animals, but that what they generate should not be of the same kind is peculiar to them, for the erythrinus generates an erythrinus and the channa a channa. The reason is that bees themselves are not generated like flies and similar creatures, but from a kind different indeed but akin to them, for they are

produced from the leaders. Hence in a sort of way their generation is analogous. For the leaders resemble the drones in size and the bees in possessing a sting; so the bees are like them in this respect, and the drones are like them in size. For there must needs be some overlapping unless the same kind is always to be produced from each; but this is impossible, for at that rate the whole class would consist of leaders. The bees, then, are assimilated to them their power of generation, the drones in size; if the latter had had a sting also they would have been leaders, but as it is this much of the difficulty has been solved, for the leaders are like both kinds at once, like the bees in possessing a sting, like the drones in size.

But the leaders also must be generated from something. Since it is neither from the bees nor from the drones, it must be from their own kind. The grubs of the kings are produced last and are not many in number.

Thus what happens is this: the leaders generate their own kind but also another kind, that of the bees; the bees again generate another kind, the drones, but do not also generate their own kind, but this has been denied them. And since what is according to Nature is always in due order, therefore it is necessary that it should be denied to the drones even to generate another kind than themselves. This is just what we find happening, for though the drones are themselves generated, they generate nothing else, but the process reaches its limit in the third stage. And so beautifully is this arranged by Nature that the three kinds always continue in existence and none of them fails, though they do not all generate.

Another fact is also natural, that in fine seasons much honey is collected and many drones are produced but in rainy reasons a large brood of ordinary bees. For the wet causes more residual matter to be formed in the bodies of the leaders, the fine

weather in that of the bees, for being smaller in size they need the fine weather more than the kings do. It is right also that the kings, being as it were made with a view to producing young, should remain within, freed from the labour of procuring necessaries, and also that they should be of a considerable size, their bodies being, as it were, constituted with a view to bearing young, and that the drones should be idle as having no weapon to fight for the food and because of the slowness of their bodies. But the bees are intermediate in size between the two other kinds, for this is useful for their work, and they are workers as having to support not only their young but also their fathers. And it agrees with our views that the bees attend upon their kings because they are their offspring (for if nothing of the sort had been the case the facts about their leadership would be unreasonable), and that, while they suffer the kings to do no work as being their parents, they punish the drones as their children, for it is nobler to punish one's children and those who have no work to perform. The fact that the leaders, being few, generate the bees in large numbers seems to be similar to what obtains in the generation of lions, which at first produce five, afterwards a smaller number each time at last one and thereafter none. So the leaders at first produce a number of workers, afterwards a few of their own kind; thus the brood of the latter is smaller in number than that of the former, but where Nature has taken away from them in number she has made it up again in size.

Such appears to be the truth about the generation of bees, judging from theory and from what are believed to be the facts about them; the facts, however, have not yet been sufficiently grasped; if ever they are, then credit must be given rather to observation than to theories, and to theories only if what they affirm agrees with the observed facts.

A further indication that bees are produced without copulation is the fact that the brood appears small in the cells of the comb, whereas, whenever insects are generated by copulation, the parents remain united for a long time but produce quickly something of the nature of a scolex and of a considerable size.

Concerning the generation of animals akin to them, as hornets and wasps, the facts in all cases are similar to a certain extent, but are devoid of the extraordinary features which characterize bees; this we should expect, for they have nothing divine about them as the bees have. For the so-called 'mothers' generate the young and mould the first part of the combs, but they generate by copulation with one another, for their union has often been observed. As for all the differences of each of these kind from one another and from bees, they must be investigated with the aid of the illustrations to the Enquiries.

11

Having spoken of the generation of all insects, we must now speak of the testacea. Here also the facts of generation are partly like and partly unlike those in the other classes. And this is what might be expected. For compared with animals they resemble plants, compared with plants they resemble animals, so that in a sense they appear to come into being from semen, but in another sense not so, and in one way they are spontaneously generated but in another from their own kind, or some of them in the latter way, others in the former. Because their nature answers to that of plants, therefore few or no kinds of testacea come into being on land, e.g. the snails and any others, few as they are, that resemble them; but in the sea and similar waters there are many of all kinds of forms. But the

class of plants has but few and one may say practically no representatives in the sea and such places, all such growing on the land. For plants and testacea are analogous; and in proportion as liquid has more quickening power than solid, water than earth, so much does the nature of testacea differ from that of plants, since the object of testacea is to be in such a relation to water as plants are to earth, as if plants were, so to say, land-oysters, oysters water-plants.

For such a reason also the testacea in the water vary more in form than those on the land. For the nature of liquid is more plastic than that of earth and yet not much less material, and this is especially true of the inhabitants of the sea, for fresh water, though sweet and nutritious, is cold and less material. Wherefore animals having no blood and not of a hot nature are not produced in lakes nor in the fresher among brackish waters, but only exceptionally, but it is in estuaries and at the mouths of rivers that they come into being, as testacea and cephalopoda and crustacea, all these being bloodless and of a cold nature. For they seek at the same time the warmth of the sun and food; now the sea is not only water but much more material than fresh water and hot in its nature; it has a share in all the parts of the universe, water and air and earth, so that it also has a share in all living things which are produced in connexion with each of these elements. Plants may be assigned to land, the aquatic animals to water, the land animals to air, but variations of quantity and distance make a great and wonderful difference. The fourth class must not be sought in these regions, though there certainly ought to be some animal corresponding to the element of fire, for this is counted in as the fourth of the elementary bodies. But the form which fire assumes never appears to be peculiar to it, but it always exists in some other of the elements, for that which is ignited appears to be either air or smoke or earth. Such a kind of animal must be sought in the moon, for this appears to participate in the element removed in

the third degree from earth. The discussion of these things however belongs to another subject.

To return to testacea, some of them are formed spontaneously, some emit a sort of generative substance from themselves, but these also often come into being from a spontaneous formation. To understand this we must grasp the different methods of generation in plants; some of these are produced from seed, some from slips, planted out, some by budding off alongside, as the class of onions. In the last way produced mussels, for smaller ones are always growing off alongside the original, but the whelks, the purple-fish, and those which are said to 'spawn' emit masses of a liquid slime as if originated by something of a seminal nature. We must not, however, consider that anything of the sort is real semen, but that these creatures participate in the resemblance to plants in the manner stated above. Hence when once one such creature has been produced, then is produced a number of them. For all these creatures are liable to be even spontaneously generated, and so to be formed still more plentifully in proportion if some are already existing. For it is natural that each should have some superfluous residue attached to it from the original, and from this buds off each of the creatures growing alongside of it. Again, since the nutriment and its residue possess a like power, it is likely that the product of those testacea which 'spawn' should resemble the original formation, and so it is natural that a new animal of the same kind should come into being from this also.

All those which do not bud off or 'spawn' are spontaneously generated. Now all things formed in this way, whether in earth or water, manifestly come into being in connexion with putrefaction and an admixture of rain-water. For as the sweet is separated off into the matter which is forming, the residue of the mixture takes such a form. Nothing comes into being by putrefying, but by concocting; putrefaction and the thing

putrefied is only a residue of that which is concocted. For nothing comes into being out of the whole of anything, any more than in the products of art; if it did art would have nothing to do, but as it is in the one case art removes the useless material, in the other Nature does so. Animals and plants come into being in earth and in liquid because there is water in earth, and air in water, and in all air is vital heat so that in a sense all things are full of soul. Therefore living things form quickly whenever this air and vital heat are enclosed in anything. When they are so enclosed, the corporeal liquids being heated, there arises as it were a frothy bubble. Whether what is forming is to be more or less honourable in kind depends on the embracing of the psychical principle; this again depends on the medium in which the generation takes place and the material which is included. Now in the sea the earthy matter is present in large quantities, and consequently the testaceous animals are formed from a concretion of this kind, the earthy matter hardening round them and solidifying in the same manner as bones and horns (for these cannot be melted by fire), and the matter (or body) which contains the life being included within it.

The class of snails is the only class of such creatures that has been seen uniting, but it has never yet been sufficiently observed whether their generation is the result of the union or not.

It may be asked, if we wish to follow the right line of investigation, what it is in such animals the formation of which corresponds to the material principle. For in the females this is a residual secretion of the animal, potentially such as that from which it came, by imparting motion to which the principle derived from the male perfects the animal. But here what must be said to correspond to this, and whence comes or what is the moving principle which corresponds to the male? We must

understand that even in animals which generate it is from the incoming nourishment that the heat in the animal makes the residue, the beginning of the conception, by secretion and concoction. The like is the case also in plants, except that in these (and also in some animals) there is no further need of the male principle, because they have it mingled with the female principle within themselves, whereas the residual secretion in most animals does need it. The nourishment again of some is earth and water, of others the more complicated combinations of these, so that what the heat in animals produces from their nutriment, this does the heat of the warm season in the environment put together and combine by concoction out of the sea-water on the earth. And the portion of the psychical principle which is either included along with it or separated off in the air makes an embryo and puts motion into it. Now in plants which are spontaneously generated the method of formation is uniform; they arise from a part of something, and while some of it is the starting-point of the plant, some is the first nourishment of the young shoots.... Other animals are produced in the form of a scolex, not only those bloodless animals which are not generated from parents but even some sanguinea, as a kind of mullet and some other river fishes and also the eel kind. For all of these, though they have but little blood by nature, are nevertheless sanguinea, and have a heart with blood in it as the origin of the parts; and the so-called 'entrails of earth', in which comes into being the body of the eel, have the nature of a scolex.

Hence one might suppose, in connexion with the origin of men and quadrupeds, that, if ever they were really 'earth-born' as some say, they came into being in one of two ways; that either it was by the formation of a scolex at first or else it was out of eggs. For either they must have had in themselves the nutriment for growth (and such a conception is a scolex) or they must have got it from elsewhere, and that either from the

mother or from part of the conception. If then the former is impossible (I mean that nourishment should flow to them from the earth as it does in animals from the mother), then they must have got it from some part of the conception, and such generation we say is from an egg.

It is plain then that, if there really was any such beginning of the generation of all animals, it is reasonable to suppose to have been one of these two, scolex or egg. But it is less reasonable to suppose that it was from eggs, for we do not see such generation occurring with any animal, but we do see the other both in the sanguinea above mentioned and in the bloodless animals. Such are some of the insects and such are the testacea which we are discussing; for they do not develop out of a part of something (as do animals from eggs), and they grow like a scolex. For the scolex grows towards the upper part and the first principle, since in the lower part is the nourishment for the upper. And this resembles the development of animals from eggs, except that these latter consume the whole egg, whereas in the scolex, when the upper part has grown by taking up into itself part of the substance in the lower part, the lower part is then differentiated out of the rest. The reason is that in later life also the nourishment is absorbed by all animals in the part below the hypozoma.

That the scolex grows in this way is plain in the case of bees and the like, for at first the lower part is large in them and the upper is smaller. The details of growth in the testacea are similar. This is plain in the whorls of the turbinata, for always as the animal grows the whorls become larger towards the front and what is called the head of the creature.

We have now pretty well described the manner of the development of these and the other spontaneously generated animals. That all the testacea are formed spontaneously is clear

from such facts as these. They come into being on the side of boats when the frothy mud putrefies. In many places where previously nothing of the kind existed, the so-called limnostrea, a kind of oyster, have come into being when the spot turned muddy through want of water; thus when a naval armament cast anchor at Rhodes a number of clay vessels were thrown out into the sea, and after some time, when mud had collected round them, oysters used to be found in them. Here is another proof that such animals do not emit any generative substance from themselves; when certain Chians carried some live oysters over from Pyrrha in Lesbos and placed them in narrow straits of the sea where tides clash, they became no more numerous as time passed, but increased greatly in size. The so-called eggs contribute to generation but are only a condition, like fat in the sanguinea, and therefore the oysters are savoury at these periods. A proof that this substance is not really eggs is the fact that such 'eggs' are always found in some testacea, as in pinnae, whelks, and purple-fish; only they are sometimes larger and sometimes smaller; in others as pectens, mussels, and the so-called limnostrea, they are not always present but only in the spring; as the season advances they dwindle and at last disappear altogether; the reason being that the spring is favourable to their being in good condition. In others again, as the ascidians, nothing of the sort is visible. (The details concerning these last, and the places in which they come into being, must be learnt from the Enquiry.)

Book IV

1

We have thus spoken of the generation of animals both generally and separately in all the different classes. But, since male and female are distinct in the most perfect of them, and since we say that the sexes are first principles of all living things whether animals or plants, only in some of them the sexes are separated and in others not, therefore we must speak first of the origin of the sexes in the latter. For while the animal is still imperfect in its kind the distinction is already made between male and female.

It is disputed, however, whether the embryo is male or female, as the case may be, even before the distinction is plain to our senses, and further whether it is thus differentiated within the mother or even earlier. It is said by some, as by Anaxagoras and other of the physicists, that this antithesis exists from the beginning in the germs or seeds; for the germ, they say, comes from the male while the female only provides the place in which it is to be developed, and the male is from the right, the female from the left testis, and so also that the male embryo is in the right of the uterus, the female in the left. Others, as Empedocles, say that the differentiation takes place in the uterus; for he says that if the uterus is hot or cold what enters it becomes male or female, the cause of the heat or cold being the flow of the catamenia, according as it is colder or hotter, more 'antique' or more 'recent'. Democritus of Abdera also says that the differentiation of sex takes place within the mother; that however it is not because of heat and cold that one embryo becomes female and another male, but that it depends on the

question which parent it is whose semen prevails, – not the whole of the semen, but that which has come from the part by which male and female differ from one another. This is a better theory, for certainly Empedocles has made a rather light-hearted assumption in thinking that the difference between them is due only to cold and heat, when he saw that there was a great difference in the whole of the sexual parts, the difference in fact between the male pudenda and the uterus. For suppose two animals already moulded in embryo, the one having all the parts of the female, the other those of the male; suppose them then to be put into the uterus as into an oven, the former when the oven is hot, the latter when it is cold; then on the view of Empedocles that which has no uterus will be female and that which has will be male. But this is impossible. Thus the theory of Democritus would be the better of the two, at least as far as this goes, for he seeks for the origin of this difference and tries to set it forth; whether he does so well or not is another question.

Again, if heat and cold were the cause of the difference of the parts, this ought to have been stated by those who maintain the view of Empedocles; for to explain the origin of male and female is practically the same thing as to explain this, which is the manifest difference between them. And it is no small matter, starting from temperature as a principle, to collect the cause of the origin of these parts, as if it were a necessary consequence for this part which they call the uterus to be formed in the embryo under the influence of cold but not under that of heat. The same applies also to the parts which serve for intercourse, since these also differ in the way stated previously.

Moreover male and female twins are often found together in the same part of the uterus; this we have observed sufficiently by dissection in all the vivipara, both land animals and fish. Now if Empedocles had not seen this it was only natural for him

to fall into error in assigning this cause of his; but if he had seen it it is strange that he should still think the heat or cold of the uterus to be the cause, since on his theory both these twins would have become either male or female, but as it is we do not see this to be the fact.

Again he says that the parts of the embryo are ‘sundered’, some being in the male and some in the female parent, which is why they desire intercourse with one another. If so it is necessary that the sexual parts like the rest should be separated from one another, already existing as masses of a certain size, and that they should come into being in the embryo on account of uniting with one another, not on account of cooling or heating of the semen. But perhaps it would take too long to discuss thoroughly such a cause as this which is stated by Empedocles, for its whole character seems to be fanciful. If, however, the facts about semen are such as we have actually stated, if it does not come from the whole of the body of the male parent and if the secretion of the male does not give any material at all to the embryo, then we must make a stand against both Empedocles and Democritus and any one else who argues on the same lines. For then it is not possible that the body of the embryo should exist ‘sundered’, part in the female parent and part in the male, as Empedocles says in the words: ‘But the nature of the limbs hath been sundered, part in the man’s…’; nor yet that a whole embryo is drawn off from each parent and the combination of the two becomes male or female according as one part prevails over another.

And, to take a more general view, though it is better to say that the one part makes the embryo female by prevailing through some superiority than to assign nothing but heat as the cause without any reflection, yet, as the form of the pudendum also varies along with the uterus from that of the father, we need an explanation of the fact that both these parts go along with each

other. If it is because they are near each other, then each of the other parts also ought to go with them, for one of the prevailing parts is always near another part where the struggle is not yet decided; thus the offspring would be not only female or male but also like its mother or father respectively in all other details.

Besides, it is absurd to suppose that these parts should come into being as something isolated, without the body as a whole having changed along with them. Take first and foremost the blood-vessels, round which the whole mass of the flesh lies as round a framework. It is not reasonable that these should become of a certain quality because of the uterus, but rather that the uterus should do so on account of them. For though it is true that each is a receptacle of blood of some kind, still the system of the vessels is prior to the other; the moving principle must needs always be prior to that which it moves, and it is because it is itself of a certain quality that it is the cause of the development. The difference, then, of these parts as compared with each other in the two sexes is only a concomitant result; not this but something else must be held to be the first principle and the cause of the development of an embryo as male or female; this is so even if no semen is secreted by either male or female, but the embryo is formed in any way you please.

The same argument as that with which we meet Empedocles and Democritus will serve against those who say that the male comes from the right and the female from the left. If the male contributes no material to the embryo, there can be nothing in this view. If, as they say, he does contribute something of the sort, we must confront them in the same way as we did the theory of Empedocles, which accounts for the difference between male and female by the heat and cold of the uterus. They make the same mistake as he does, when they account for the difference by their 'right and left', though they see that the

sexes differ actually by the whole of the sexual parts; for what reason then is the body of the uterus to exist in those embryos which come from the left and not in those from the right? For if an embryo have come from the left but has not acquired this part, it will be a female without a uterus, and so too there is nothing to stop another from being a male with a uterus! Besides as has been said before, a female embryo has been observed in the right part of the uterus, a male in the left, or again both at once in the same part, and this not only once but several times.

Some again, persuaded of the truth of a view resembling that of these philosophers, say that if a man copulates with the right or left testis tied up the result is male or female offspring respectively; so at least Leophanes asserted. And some say that the same happens in the case of those who have one or other testis excised, not speaking truth but vaticinating what will happen from probabilities and jumping at the conclusion that it is so before seeing that it proves to be so. Moreover, they know not that these parts of animals contribute nothing to the production of one sex rather than the other; a proof of this is that many animals in which the distinction of sex exists, and which produce both male and female offspring, nevertheless have no testes, as the footless animals; I mean the classes of fish and of serpents.

To suppose, then, either that heat and cold are the causes of male and female, or that the different sexes come from the right and left, is not altogether unreasonable in itself; for the right of the body is hotter than the left, and the concocted semen is hotter than the unconcocted; again, the thickened is concocted, and the more thickened is more fertile. Yet to put it in this way is to seek for the cause from too remote a starting-point; we must draw near the immediate causes in so far as it is possible for us.

We have, then, previously spoken elsewhere of both the body as a whole and its parts, explaining what each part is and for what reason it exists. But (1) the male and female are distinguished by a certain capacity and incapacity. (For the male is that which can concoct the blood into semen and which can form and secrete and discharge a semen carrying with it the principle of form – by 'principle' I do not mean a material principle out of which comes into being an offspring resembling the parent, but I mean the first moving cause, whether it have power to act as such in the thing itself or in something else – but the female is that which receives semen, indeed, but cannot form it for itself or secrete or discharge it.) And (2) all concoction works by means of heat. Therefore the males of animals must needs be hotter than the females. For it is by reason of cold and incapacity that the female is more abundant in blood in certain parts of her anatomy, and this abundance is an evidence of the exact opposite of what some suppose, thinking that the female is hotter than the male for this reason, i.e. the discharge of the catamenia. It is true that blood is hot, and that which has more of it is hotter than that which has less. But they assume that this discharge occurs through excess of blood and of heat, as if it could be taken for granted that all blood is equally blood if only it be liquid and sanguineous in colour, and as if it might not become less in quantity but purer in quality in those who assimilate nourishment properly. In fact they look upon this residual discharge in the same light as that of the intestines, when they think that a greater amount of it is a sign of a hotter nature, whereas the truth is just the opposite. For consider the production of fruit; the nutriment in its first stage is abundant, but the useful product derived from it is small, indeed the final result is nothing at all compared to the quantity in the first stage. So is it with the body; the various parts receive and work up the nutriment, from the whole of which the final result is quite small. This is blood in some animals, in some its analogue.

Now since (1) the one sex is able and the other is unable to reduce the residual secretion to a pure form, and (2) every capacity or power in an organism has a certain corresponding organ, whether the faculty produces the desired results in a lower degree or in a higher degree, and the two sexes correspond in this manner (the terms 'able' and 'unable' being used in more senses than one) – therefore it is necessary that both female and male should have organs. Accordingly the one has the uterus, the other the male organs.

Again, Nature gives both the faculty and the organ to each individual at the same time, for it is better so. Hence each region comes into being along with the secretions and the faculties, as e.g. the faculty of sight is not perfected without the eye, nor the eye without the faculty of sight; and so too the intestine and bladder come into being along with the faculty of forming the excreta. And since that from which an organ comes into being and that by which it is increased are the same (i.e. the nutriment), each of the parts will be made out of such a material and such residual matter as it is able to receive. In the second place, again, it is formed, as we say, in a certain sense, out of its opposite. Thirdly, we must understand besides this that, if it is true that when a thing perishes it becomes the opposite of what it was, it is necessary also that what is not under the sway of that which made it must change into its opposite. After these premisses it will perhaps be now clearer for what reason one embryo becomes female and another male. For when the first principle does not bear sway and cannot concoct the nourishment through lack of heat nor bring it into its proper form, but is defeated in this respect, then must needs the material which it works on change into its opposite. Now the female is opposite to the male, and that in so far as the one is female and the other male. And since it differs in its faculty, its organ also is different, so that the embryo changes into this state. And as one part of first-rate importance changes, the

whole system of the animal differs greatly in form along with it. This may be seen in the case of eunuchs, who, though mutilated in one part alone, depart so much from their original appearance and approximate closely to the female form. The reason of this is that some of the parts are principles, and when a principle is moved or affected needs must many of the parts that go along with it change with it.

If then (1) the male quality or essence is a principle and a cause, and (2) the male is such in virtue of a certain capacity and the female is such in virtue of an incapacity, and (3) the essence or definition of the capacity and of the incapacity is ability or inability to concoct the nourishment in its ultimate stage, this being called blood in the sanguinea and the analogue of blood in the other animals, and (4) the cause of this capacity is in the first principle and in the part which contains the principle of natural heat – therefore a heart must be formed in the sanguinea (and the resulting animal will be either male or female), and in the other kinds which possess the sexes must be formed that which is analogous to the heart.

This, then, is the first principle and cause of male and female, and this is the part of the body in which it resides. But the animal becomes definitely female or male by the time when it possesses also the parts by which the female differs from the male, for it is not in virtue of any part you please that it is male or female, any more than it is able to see or hear by possessing any part you please.

To recapitulate, we say that the semen, which is the foundation of the embryo, is the ultimate secretion of the nutriment. By ultimate I mean that which is carried to every part of the body, and this is also the reason why the offspring is like the parent. For it makes no difference whether we say that the semen comes from all the parts or goes to all of them, but the latter is

the better. But the semen of the male differs from the corresponding secretion of the female in that it contains a principle within itself of such a kind as to set up movements also in the embryo and to concoct thoroughly the ultimate nourishment, whereas the secretion of the female contains material alone. If, then, the male element prevails it draws the female element into itself, but if it is prevailed over it changes into the opposite or is destroyed. But the female is opposite to the male, and is female because of its inability to concoct and of the coldness of the sanguineous nutriment. And Nature assigns to each of the secretions the part fitted to receive it. But the semen is a secretion, and this in the hotter animals with blood, i.e. the males, is moderate in quantity, wherefore the recipient parts of this secretion in males are only passages. But the females, owing to inability to concoct, have a great quantity of blood, for it cannot be worked up into semen. Therefore they must also have a part to receive this, and this part must be unlike the passages of the male and of a considerable size. This is why the uterus is of such a nature, this being the part by which the female differs from the male.

2

We have thus stated for what reason the one becomes female and the other male. Observed facts confirm what we have said. For more females are produced by the young and by those verging on old age than by those in the prime of life; in the former the vital heat is not yet perfect, in the latter it is failing. And those of a moister and more feminine state of body are more wont to beget females, and a liquid semen causes this more than a thicker; now all these characteristics come of deficiency in natural heat.

Again, more males are born if copulation takes place when north than when south winds are blowing. For in the latter case the animals produce more secretion, and too much secretion is harder to concoct; hence the semen of the males is more liquid, and so is the discharge of the catamenia.

Also the fact that the catamenia occur in the course of nature rather when the month is waning is due to the same causes. For this time of the month is colder and moister because of the waning and failure of the moon; as the sun makes winter and summer in the year as a whole, so does the moon in the month. This is not due to the turning of the moon, but it grows warmer as the light increases and colder as it wanes.

The shepherds also say that it not only makes a difference in the production of males and females if copulation takes place during northern or southerly winds, but even if the animals while copulating look towards the south or north; so small a thing will sometimes turn the scale and cause cold or heat, and these again influence generation.

The male and female, then, are distinguished generally, as compared with one another in connexion with the production of male and female offspring, for the causes stated. However, they also need a certain correspondence with one another to produce at all, for all things that come into being as products of art or of Nature exist in virtue of a certain ratio. Now if the hot preponderates too much it dries up the liquid; if it is very deficient it does not solidify it; for the artistic or natural product we need the due mean between the extremes. Otherwise it will be as in cooking; too much fire burns the meat, too little does not cook it, and in either case the process is a failure. So also there is need of due proportion in the mixture of the male and female elements. And for this cause it often happens to many of both sexes that they do not generate with one another, but if

divorced and remarried to others do generate; and these oppositions show themselves sometimes in youth, sometimes in advanced age, alike as concerns fertility or infertility, and as concerns generation of male or female offspring.

One country also differs from another in these respects, and one water from another, for the same reasons. For the nourishment and the medical condition of the body are of such or such a kind because of the tempering of the surrounding air and of the food entering the body, especially the water; for men consume more of this than of anything else, and this enters as nourishment into all food, even solids. Hence hard waters cause infertility, and cold waters the birth of females.

3

The same causes must be held responsible for the following groups of facts. (1) Some children resemble their parents, while others do not; some being like the father and others like the mother, both in the body as a whole and in each part, male and female offspring resembling father and mother respectively rather than the other way about. (2) They resemble their parents more than remoter ancestors, and resemble those ancestors more than any chance individual. (3) Some, though resembling none of their relations, yet do at any rate resemble a human being, but others are not even like a human being but a monstrosity. For even he who does not resemble his parents is already in a certain sense a monstrosity; for in these cases Nature has in a way departed from the type. The first departure indeed is that the offspring should become female instead of male; this, however, is a natural necessity. (For the class of animals divided into sexes must be preserved, and as it is

possible for the male sometimes not to prevail over the female in the mixture of the two elements, either through youth or age or some other such cause, it is necessary that animals should produce female young). And the monstrosity, though not necessary in regard of a final cause and an end, yet is necessary accidentally. As for the origin of it, we must look at it in this way. If the generative secretion in the catamenia is properly concocted, the movement imparted by the male will make the form of the embryo in the likeness of itself. (Whether we say that it is the semen or this movement that makes each of the parts grow, makes no difference; nor again whether we say that it 'makes them grow' or 'forms them from the beginning', for the formula of the movement is the same in either case.) Thus if this movement prevail, it will make the embryo male and not female, like the father and not like the mother; if it prevail not, the embryo is deficient in that faculty in which it has not prevailed. By 'each faculty' I mean this. That which generates is not only male but also a particular male, e.g. Coriscus or Socrates, and it is not only Coriscus but also a man. In this way some of the characteristics of the father are more near to him, others more remote from him considered simply as a parent and not in reference to his accidental qualities (as for instance if the parent is a scholar or the neighbour of some particular person). Now the peculiar and individual has always more force in generation than the more general and wider characteristics. Coriscus is both a man and an animal, but his manhood is nearer to his individual existence than is his animalhood. In generation both the individual and the class are operative, but the individual is the more so of the two, for this is the only true existence. And the offspring is produced indeed of a certain quality, but also as an individual, and this latter is the true existence. Therefore it is from the forces of all such existences that the efficient movements come which exist in the semen; potentially from remoter ancestors but in a higher degree and

more nearly from the individual (and by the individual I mean e.g. Coriscus or Socrates). Now since everything changes not into anything haphazard but into its opposite, therefore also that which is not prevailed over in generation must change and become the opposite, in respect of that particular force in which the paternal and efficient or moving element has not prevailed. If then it has not prevailed in so far as it is male, the offspring becomes female; if in so far as it is Coriscus or Socrates, the offspring does not resemble the father but the mother. For as 'father' and 'mother' are opposed as general terms, so also the individual father is opposed to the individual mother. The like applies also to the forces that come next in order, for the offspring always changes rather into the likeness of the nearer ancestor than the more remote, both in the paternal and in the maternal line.

Some of the movements exist in the semen actually, others potentially; actually, those of the father and the general type, as man and animal; potentially those of the female and the remoter ancestors. Thus the male and efficient principle, if it lose its own nature, changes to its opposites, but the movements which form the embryo change into those nearly connected with them; for instance, if the movement of the male parent be resolved, it changes by a very slight difference into that of his father, and in the next instance into that of his grandfather; and in this way not only in the male but also in the female line the movement of the female parent changes into that of her mother, and, if not into this, then into that of her grandmother; and similarly also with the more remote ancestors.

Naturally then it is most likely that the characteristics of 'male' and of the individual father will go together, whether they prevail or are prevailed over. For the difference between them is small so that there is no difficulty in both concurring, for

Socrates is an individual man with certain characters. Hence for the most part the male offspring resemble the father, and the female the mother. For in the latter case the loss of both characters takes place at once, and the change is into the two opposites; now is opposed to male, and the individual mother to the individual father.

But if the movement coming from the male principle prevails while that coming from the individual Socrates does not, or vice versa, then the result is that male children are produced resembling the mother and female children resembling the father.

If again the movements be resolved, if the male character remain but the movement coming from the individual Socrates be resolved into that of the father of Socrates, the result will be a male child resembling its grandfather or some other of its more remote ancestors in the male line on the same principle. If the male principle be prevailed over, the child will be female and resembling most probably its mother, but, if the movement coming from the mother also be resolved, it will resemble its mother's mother or the resemblance will be to some other of its more remote ancestors in the female line on the same principle.

The same applies also to the separate parts, for often some of these take after the father, and others after the mother, and yet others after some of the remoter ancestors. For, as has been often said already, some of the movements which form the parts exist in the semen actually and others potentially. We must grasp certain fundamental general principles, not only that just mentioned (that some of the movements exist potentially and others actually), but also two others, that if a character be prevailed over it changes into its opposite, and, if it be resolved, is resolved into the movement next allied to it – if less, into that which is near, if more, into that which is further

removed. Finally, the movements are so confused together that there is no resemblance to any of the family or kindred, but the only character that remains is that common to the race, i.e. it is a human being. The reason of this is that this is closely knit up with the individual characteristics; 'human being' is the general term, while Socrates, the father, and the mother, whoever she may be, are individuals.

The reason why the movements are resolved is this. The agent is itself acted upon by that on which it acts; thus that which cuts is blunted by that which is cut by it, that which heats is cooled by that which is heated by it, and in general the moving or efficient cause (except in the case of the first cause of all) does itself receive some motion in return; e.g. what pushes is itself in a way pushed again and what crushes is itself crushed again. Sometimes it is altogether more acted upon than is the thing on which it acts, so that what is heating or cooling something else is itself cooled or heated; sometimes having produced no effect, sometimes less than it has itself received. (This question has been treated in the special discussion of action and reaction, where it is laid down in what classes of things action and reaction exist.) Now that which is acted on escapes and is not mastered by the semen, either through deficiency of power in the concocting and moving agent or because what should be concocted and formed into distinct parts is too cold and in too great quantity. Thus the moving agent, mastering it in one part but not in another, makes the embryo in formation to be multiform, as happens with athletes because they eat so much. For owing to the quantity of their food their nature is not able to master it all, so as to increase and arrange their form symmetrically; therefore their limbs develop irregularly, sometimes indeed almost so much that no one of them resembles what it was before. Similar to this is also the disease known as satyrism, in which the face appears like

that of a satyr owing to a quantity of unconcocted humour or wind being diverted into parts of the face.

We have thus discussed the cause of all these phenomena, (1) female and male offspring are produced, (2) why some are similar to their parents, female to female and male to male, and others the other way about, females being similar to the father and males to the mother, and in general why some are like their ancestors while others are like none of them, and all this as concerns both the body as a whole and each of the parts separately. Different accounts, however, have been given of these phenomena by some of the nature-philosophers; I mean why children are like or unlike their parents. They give two versions of the reason. Some say that the child is more like that parent of the two from whom comes more semen, this applying equally both to the body as a whole and to the separate parts, on the assumption that semen comes from each part of both parents; if an equal part comes from each, then, they say, the child is like neither. But if this is false, if semen does not come off from the whole body of the parents, it is clear that the reason assigned cannot be the cause of likeness and unlikeness. Moreover, they are hard put to it to explain how it is that a female child can be like the father and a male like the mother. For (1) those who assign the same cause of sex as Empedocles or Democritus say what is on other grounds impossible, and (2) those who say that it is determined by the greater or smaller amount of semen coming the male or female parent, and that this is why one child is male and another female, cannot show how the female is to resemble the father and the male the mother, for it is impossible that more should come from both at once. Again, for what reason is a child generally like its ancestors, even the more remote? None of the semen has come from them at any rate.

But those who account for the similarity in the manner which remains to be discussed, explain this point better, as well as the others. For there are some who say that the semen, though one, is as it were a common mixture (panspermia) of many elements; just as, if one should mix many juices in one liquid and then take some from it, it would be possible to take, not an equal quantity always from each juice, but sometimes more of one and sometimes more of another, sometimes some of one and none at all of another, so they say it is with the generative fluid, which is a mixture of many elements, for the offspring resembles that parent from which it has derived most. Though this theory is obscure and in many ways fictitious, it aims at what is better expressed by saying that what is called 'panspermia' exists potentially, not actually; it cannot exist actually, but it can do so potentially. Also, if we assign only one sort of cause, it is not easy to explain all the phenomena, (1) the distinction of sex, (2) why the female is often like the father and the male like the mother, and again (3) the resemblance to remoter ancestors, and further (4) the reason why the offspring is sometimes unlike any of these but still a human being, but sometimes, (5) proceeding further on these lines, appears finally to be not even a human being but only some kind of animal, what is called a monstrosity.

For, following what has been said, it remains to give the reason for such monsters. If the movements imparted by the semen are resolved and the material contributed by the mother is not controlled by them, at last there remains the most general substratum, that is to say the animal. Then people say that the child has the head of a ram or a bull, and so on with other animals, as that a calf has the head of a child or a sheep that of an ox. All these monsters result from the causes stated above, but they are none of the things they are said to be; there is only some similarity, such as may arise even where there is no defect of growth. Hence often jesters compare some one who is not

beautiful to a ‘goat breathing fire’, or again to a ‘ram butting’, and a certain physiognomist reduced all faces to those of two or three animals, and his arguments often prevailed on people.

That, however, it is impossible for such a monstrosity to come into existence – I mean one animal in another – is shown by the great difference in the period of gestation between man, sheep, dog, and ox, it being impossible for each to be developed except in its proper time.

This is the description of some of the monsters talked about; others are such because certain parts of their form are multiplied so that they are born with many feet or many heads.

The account of the cause of monstrosities is very close and similar in a way to that of the cause of animals being born defective in any part, for monstrosity is also a kind of deficiency.

4

Democritus said that monstrosities arose because two emissions of seminal fluid met together, the one succeeding the other at an interval of time; that the later entering into the uterus reinforced the earlier so that the parts of the embryo grow together and get confused with one another. But in birds, he says, since copulation takes place quickly, both the eggs and their colour always cross one another. But if it is the fact, as it manifestly is, that several young are produced from one emission of semen and a single act of intercourse, it is better not to desert the short road to go a long way about, for in such cases it is absolutely necessary that this should occur when the semen is not separated but all enters the female at once.

If, then, we must attribute the cause to the semen of the male, this will be the way we shall have to state it, but we must rather by all means suppose that the cause lies in the material contributed by the female and in the embryo as it is forming. Hence also such monstrosities appear very rarely in animals producing only one young one, more frequently in those producing many, most of all in birds and among birds in the common fowl. For this bird produces many young, not only because it lays often like the pigeon family, but also because it has many embryos at once and copulates all the year round. Therefore it produces many double eggs, for the embryos grow together because they are near one another, as often happens with many fruits. In such double eggs, when the yolks are separated by the membrane, two separate chickens are produced with nothing abnormal about them; when the yolks are continuous, with no division between them, the chickens produced are monstrous, having one body and head but four legs and four wings; this is because the upper parts are formed earlier from the white, their nourishment being drawn from the yolk, whereas the lower part comes into being later and its nourishment is one and indivisible.

A snake has also been observed with two heads for the same reason, this class also being oviparous and producing many young. Monstrosities, however, are rarer among them owing to the shape of the uterus, for by reason of its length the numerous eggs are set in a line.

Nothing of the kind occurs with bees and wasps, because their brood is in separate cells. But in the fowl the opposite is the case, whereby it is plain that we must hold the cause of such phenomena to lie in the material. So, too, monstrosities are commoner in other animals if they produce many young. Hence they are less common in man, for he produces for the most part only one young one and that perfect; even in man monstrosities

occur more often in regions where the women give birth to more than one at a time, as in Egypt. And they are commoner in sheep and goats, since they produce more young. Still more does this apply to the fissipeds, for such animals produce many young and imperfect, as the dog, the young of these creatures being generally blind. Why this happens and why they produce many young must be stated later, but in them Nature has made an advance towards the production of monstrosities in that what they generate, being imperfect, is so far unlike the parent; now monstrosities also belong to the class of things unlike the parent. Therefore this accident also often invades animals of such a nature. So, too, it is in these that the so-called 'metachoera' are most frequent, and the condition of these also is in a way monstrous, since both deficiency and excess are monstrous. For the monstrosity belongs to the class of things contrary to Nature, not any and every kind of Nature, but Nature in her usual operations; nothing can happen contrary to Nature considered as eternal and necessary, but we speak of things being contrary to her in those cases where things generally happen in a certain way but may also happen in another way. In fact, even in the case of monstrosities, whenever things occur contrary indeed to the established order but still always in a certain way and not at random, the result seems to be less of a monstrosity because even that which is contrary to Nature is in a certain sense according to Nature, whenever, that is, the formal nature has not mastered the material nature. Therefore they do not call such things monstrosities any more than in the other cases where a phenomenon occurs habitually, as in fruits; for instance, there is a vine which some call 'capneos'; if this bear black grapes they do not judge it a monstrosity because it is in the habit of doing this very often. The reason is that it is in its nature intermediate between white and black; thus the change is not a violent one nor, so to say, contrary to Nature; at least, is it not a change into another nature. But in animals

producing many young not only do the same phenomena occur, but also the numerous embryos hinder one another from becoming perfect and interfere with the generative motions imparted by the semen.

A difficulty may be raised concerning (1) the production of many young and the multiplication of the parts in a single young one, and (2) the production of few young or only one and the deficiency of the parts. Sometimes animals are born with too many toes, sometimes with one alone, and so on with the other parts, for they may be multiplied or they may be absent. Again, they may have the generative parts doubled, the one being male, the other female; this is known in men and especially in goats. For what are called 'tragaenae' are such because they have both male and female generative parts; there is a case also of a goat being born with a horn upon its leg. Changes and deficiencies are found also in the internal parts, animals either not possessing some at all, or possessing them in a rudimentary condition, or too numerous or in the wrong place. No animal, indeed, has ever been born without a heart, but they are born without a spleen or with two spleens or with one kidney; there is no case again of total absence of the liver, but there are cases of its being incomplete. And all these phenomena have been seen in animals perfect and alive. Animals also which naturally have a gall-bladder are found without one; others are found to have more than one. Cases are known, too, of the organs changing places, the liver being on the left, the spleen on the right. These phenomena have been observed, as stated above, in animals whose growth is perfected; at the time of birth great confusion of every kind has been found. Those deficiency which only depart a little from Nature commonly live; not so those which depart further, when the unnatural condition is in the parts which are sovereign over life.

The question then about all these cases is this. Are we to suppose that a single cause is responsible for the production of a single young one and for the deficiency of the parts, and another but still a single cause for the production of many young and the multiplication of parts, or not?

In the first place it seems only reasonable to wonder why some animals produce many young, others only one. For it is the largest animals that produce one, e.g. the elephant, camel, horse, and the other solid-hoofed ungulates; of these some are larger than all other animals, while the others are of a remarkable size. But the dog, the wolf, and practically all the fissipeds, produce many, even the small members of the class, as the mouse family. The cloven-footed animals again produce few, except the pig, which belongs to those that produce many. This certainly seems surprising, for we should expect the large animals to be able to generate more young and to secrete more semen. But precisely what we wonder at is the reason for not wondering; it is just because of their size that they do not produce many young, for the nutriment is expended in such animals upon increasing the body. But in the smaller animals Nature takes away from the size and adds the excess so gained to the seminal secretion. Moreover, more semen must needs be used in generation by the larger animal, and little by the smaller. Therefore many small ones may be produced together, but it is hard for many large ones to be so, and to those intermediate in size Nature has assigned the intermediate number. We have formerly given the reason why some animals are large, some smaller, and some between the two, and speaking generally, with regard to the number of young produced, the solid-hoofed produce one, the cloven-footed few, the many-toed many. (The reason of this is that, generally speaking, their sizes correspond to this difference.) It is not so, however, in all cases; for it is the largeness and smallness of the body that is cause of few or many young being born, not the fact

that the kind of animal has one, two, or many toes. A proof of this is that the elephant is the largest of animals and yet is many-toed, and the camel, the next largest, is cloven-footed. And not only in animals that walk but also in those that fly or swim the large ones produce few, the small many, for the same reason. In like manner also it is not the largest plants that bear most fruit.

We have explained then why some animals naturally produce many young, some but few, and some only one; in the difficulty now stated we may rather be surprised with reason at those which produce many, since such animals are often seen to conceive from a single copulation. Whether the semen of the male contributes to the material of the embryo by itself becoming a part of it and mixing with the semen of the female, or whether, as we say, it does not act in this way but brings together and fashions the material within the female and the generative secretion as the fig-juice does the liquid substance of milk, what is the reason why it does not form a single animal of considerable size? For certainly in the parallel case the fig-juice is not separated if it has to curdle a large quantity of milk, but the more the milk and the more the fig-juice put into it, so much the greater is the curdled mass. Now it is no use to say that the several regions of the uterus attract the semen and therefore more young than one are formed, because the regions are many and the cotyledons are more than one. For two embryos are often formed in the same region of the uterus, and they may be seen lying in a row in animals that produce many, when the uterus is filled with the embryos. (This is plain from the dissections.) Rather the truth is this. As animals complete their growth there are certain limits to their size, both upwards and downwards, beyond which they cannot go, but it is in the space between these limits that they exceed or fall short of one another in size, and it is within these limits that one man (or any other animal) is larger or smaller than another. So also the

generative material from which each animal is formed is not without a quantitative limit in both directions, nor can it be formed from any quantity you please. Whenever then an animal, for the cause assigned, discharges more of the female secretion than is needed for beginning the existence of a single animal, it is not possible that only one should be formed out of all this, but a number limited by the appropriate size in each case; nor will the semen of the male, or the power residing in the semen, form anything either more or less than what is according to Nature. In like manner, if the male emits more semen than is necessary, or more powers in different parts of the semen as it is divided, however much it is it will not make anything greater; on the contrary it will dry up the material of the female and destroy it. So fire also does not continue to make water hotter in proportion as it is itself increased, but there is a fixed limit to the heat of which water is capable; if that is once reached and the fire is then increased, the water no longer gets hotter but rather evaporates and at last disappears and is dried up. Now since it appears that the secretion of the female and that from the male need to stand in some proportionate relation to one another (I mean in animals of which the male emits semen), what happens in those that produce many young is this: from the very first the semen emitted by the male has power, being divided, to form several embryos, and the material contributed by the female is so much that several can be formed out of it. (The parallel of curdling milk, which we spoke of before, is no longer in point here, for what is formed by the heat of the semen is not only of a certain quantity but also of a certain quality, whereas with fig-juice and rennet quantity alone is concerned.) This then is just the reason why in such animals the embryos formed are numerous and do not all unite into one whole; it is because an embryo is not formed out of any quantity you please, but whether there is too much or too little, in either case there will be no result, for there is a limit set alike

to the power of the heat which acts on the material and to the material so acted upon.

On the same principle many embryos are not formed, though the secretion is much, in the large animals which produce only one young one, for in them also both the material and that which works upon it are of a certain quantity. So then they do not secrete such material in too great quantity for the reason previously stated, and what they do secrete is naturally just enough for one embryo alone to be formed from it. If ever too much is secreted, then twins are born. Hence such cases seem to be more portentous, because they are contrary to the general and customary rule.

Man belongs to all three classes, for he produces one only and sometimes many or few, though naturally he almost always produces one. Because of the moisture and heat of his body he may produce many [for semen is naturally fluid and hot], but because of his size he produces few or one. On account of this it results that in man alone among animals the period of gestation is irregular; whereas the period is fixed in the rest, there are several periods in man, for children are born at seven months and at ten months and at the times between, for even those of eight months do live though less often than the rest. The reason may be gathered from what has just been said, and the question has been discussed in the Problems. Let this explanation suffice for these points.

The cause why the parts may be multiplied contrary to Nature is the same as the cause of the birth of twins. For the reason exists already in the embryo, whenever it aggregates more material at any point of itself than is required by the nature of the part. The result is then that either one of its parts is larger than the others, as a finger or hand or foot or any of the other extremities or limbs; or again if the embryo is cleft there may

come into being more than one such part, as eddies do in rivers; as the water in these is carried along with a certain motion, if it dash against anything two systems or eddies come into being out of one, each retaining the same motion; the same thing happens also with the embryos. The abnormal parts generally are attached near those they resemble, but sometimes at a distance because of the movement – taking place in the embryo, and especially because of the excess of material returning to that place whence it was taken away while retaining the form of that part whence it arose as a superfluity.

In certain cases we find a double set of generative organs [one male and the other female]. When such duplication occurs the one is always functional but not the other, because it is always insufficiently supplied with nourishment as being contrary to Nature; it is attached like a growth (for such growths also receive nourishment though they are a later development than the body proper and contrary to Nature.) If the formative power prevails, both are similar; if it is altogether vanquished, both are similar; but if it prevail here and be vanquished there, then the one is female and the other male. (For whether we consider the reason why the whole animal is male or female, or why the parts are so, makes no difference.)

When we meet with deficiency in such parts, e.g. an extremity or one of the other members, we must assume the same cause as when the embryo is altogether aborted (abortion of embryos happens frequently).

Outgrowths differ from the production of many young in the manner stated before; monsters differ from these in that most of them are due to embryos growing together. Some however are also of the following kind, when the monstrosity affects greater and more sovereign parts, as for instance some monsters have two spleens or more than two kidneys. Further,

the parts may migrate, the movements which form the embryo being diverted and the material changing its place. We must decide whether the monstrous animal is one or is composed of several grown together by considering the vital principle; thus, if the heart is a part of such a kind then that which has one heart will be one animal, the multiplied parts being mere outgrowths, but those which have more than one heart will be two animals grown together through their embryos having been confused.

It also often happens even in many animals that do not seem to be defective and whose growth is now complete, that some of their passages may have grown together or others may have been diverted from the normal course. Thus in some women before now the os uteri has remained closed, so that when the time for the catamenia has arrived pain has attacked them, till either the passage has burst open of its own accord or the physicians have removed the impediment; some such cases have ended in death if the rupture has been made too violently or if it has been impossible to make it at all. In some boys on the other hand the end of the penis has not coincided with the end of the passage where the urine is voided, but the passage has ended below, so that they crouch sitting to void it, and if the testes are drawn up they appear from a distance to have both male and female generative organs. The passage of the solid food also has been closed before now in sheep and some other animals; there was a cow in Perinthus which passed fine matter, as if it were sifted, through the bladder, and when the anus was cut open it quickly closed up again nor could they succeed in keeping it open.

We have now spoken of the production of few and many young, and of the outgrowth of superfluous parts or of their deficiency, and also of monstrosities.

5

Superfoetation does not occur at all in some animals but does in others; of the former some are able to bring the later formed embryo to birth, while others can only do so sometimes. The reason why it does not occur in some is that they produce only one young one, for it is not found in solid-hoofed animals and those larger than these, as owing to their size the secretion of the female is all used up for the one embryo. For all these have large bodies, and when an animal is large its foetus is large in proportion, e.g. the foetus of the elephant is as big as a calf. But superfoetation occurs in those which produce many young because the production of more than one at a birth is itself a sort of superfoetation, one being added to another. Of these all that are large, as man, bring to birth the later embryo, if the second impregnation takes place soon after the first, for such an event has been observed before now. The reason is that given above, for even in a single act of intercourse the semen discharged is more than enough for one embryo, and this being divided causes more than one child to be born, the one of which is later than the other. But when the embryo has already grown to some size and it so happens that copulation occurs again, superfoetation sometimes takes place, but rarely, since the uterus generally closes in women during the period of gestation. If this ever happens (for this also has occurred) the mother cannot bring the second embryo to perfection, but it is cast out in a state like what are called abortions. For just as, in those animals that bear only one, all the secretion of the female is converted to the first formed embryo because of its size, so it is here also; the only difference is that in the former case this happens at once, in the latter when the foetus has attained to some size, for then they are in the same state as those that bear only one. In like manner, since man naturally would produce

many young, and since the size of the uterus and the quantity of the female secretion are both greater than is necessary for one embryo, only not so much so as to bring to birth a second, therefore women and mares are the only animals which admit the male during gestation, the former for the reason stated, and mares both because of the barrenness of their nature and because their uterus is of superfluous size, too large for one but too small to allow a second embryo to be brought to perfection by superfoetation. And the mare is naturally inclined to sexual intercourse because she is in the same case as the barren among women; these latter are barren because they have no monthly discharge (which corresponds to the act of intercourse in males) and mares have exceedingly little. And in all the vivipara the barren females are so inclined, because they resemble the males when the semen has collected in the testes but is not being got rid of. For the discharge of the catamenia is in females a sort of emission of semen, they being unconcocted semen as has been said before. Hence it is that those women also who are incontinent in regard to such intercourse cease from their passion for it when they have borne many children, for, the seminal secretion being then drained off, they no longer desire this intercourse. And among birds the hens are less disposed that way than the cocks, because the uterus of the hen-bird is up near the hypozoma; but with the cock-birds it is the other way, for their testes are drawn up within them, so that, if any kind of such birds has much semen naturally, it is always in need of this intercourse. In females then it encourages copulation to have the uterus low down, but in males to have the testes drawn up.

It has been now stated why superfoetation is not found in some animals at all, why it is found in others which sometimes bring the later embryos to birth and sometimes not, and why some such animals are inclined to sexual intercourse while others are not.

Some of those animals in which superfoetation occurs can bring the embryos to birth even if a long time elapses between the two impregnations, if their kind is spermatic, if their body is not of a large size, and if they bear many young. For because they bear many their uterus is spacious, because they are spermatic the generative discharge is copious, and because the body is not large but the discharge is excessive and in greater measure than is required for the nourishment wanted for the embryo, therefore they can not only form animals but also bring them to birth later on. Further, the uterus in such animals does not close up during gestation because there is a quantity of the residual discharge left over. This has happened before now even in women, for in some of them the discharge continues during all the time of pregnancy. In women, however, this is contrary to Nature, so that the embryo suffers, but in such animals it is according to Nature, for their body is so formed from the beginning, as with hares. For superfoetation occurs in these animals, since they are not large and they bear many young (for they have many toes and the many-toed animals bear many), and they are spermatic. This is shown by their hairiness, for the quantity of their hair is excessive, these animals alone having hair under the feet and within the jaws. Now hairiness is a sign of abundance of residual matter, wherefore among men also the hairy are given to sexual intercourse and have much semen rather than the smooth. In the hare it often happens that some of the embryos are imperfect while others of its young are produced perfect.

6

Some of the vivipara produce their young imperfect, others perfect; the one-hoofed and cloven-footed perfect, most of the

many-toed imperfect. The reason of this is that the one-hoofed produce one young one, and the cloven-footed either one or two generally speaking; now it is easy to bring the few to perfection. All the many-toed animals that bear their young imperfect give birth to many. Hence, though they are able to nourish the embryos while newly formed, their bodies are unable to complete the process when the embryos have grown and acquired some size. So they produce them imperfect, like those animals which generate a scolex, for some of them when born are scarcely brought into form at all, as the fox, bear, and lion, and some of the rest in like manner; and nearly all of them are blind, as not only the animals mentioned but also the dog, wolf, and jackal. The pig alone produces both many and perfect young, and thus here alone we find any overlapping; it produces many as do the many-toed animals, but is cloven-footed or solid-hoofed (for there certainly are solid-hoofed swine). They bear, then, many young because the nutriment which would otherwise go to increase their size is diverted to the generative secretion (for considered as a solid-hoofed animal the pig is not a large one), and also it is more often cloven-hoofed, striving as it were with the nature of the solid-hoofed animals. For this reason it produces sometimes only one, sometimes two, but generally many, and brings them to perfection before birth because of the good condition of its body, being like a rich soil – which has sufficient and abundant nutriment for plants.

The young of some birds also are hatched imperfect, that is to say blind; this applies to all small birds which lay many eggs, as crows and rooks, jays, sparrows, swallows, and to all those which lay few eggs without producing abundant nourishment along with the young, as ring-doves, turtle-doves, and pigeons. Hence if the eyes of swallows while still young be put out they recover their sight again, for the birds are still developing, not yet developed, when the injury is inflicted, so that the eyes grow and sprout afresh. And in general the production of young

before they are perfect is owing to inability to continue nourishing them, and they are born imperfect because they are born too soon. This is plain also with seven-months children, for since they are not perfected it often happens that even the passages, e.g. of the ears and nostrils, are not yet opened in some of them at birth, but only open later as they are growing, and many such infants survive.

In man males are more often born defective than females, but in the other animals this is not the case. The reason is that in man the male is much superior to the female in natural heat, and so the male foetus moves about more than the female, and on account of moving is more liable to injury, for what is young is easily injured since it is weak. For this same reason also the female foetus is not perfected equally with the male in man (but they are so in the other animals, for in them the female is not later in developing than the male). For while within the mother the female takes longer in developing, but after birth everything is perfected more quickly in females than in males; I mean, for instance, puberty, the prime of life, and old age. For females are weaker and colder in nature, and we must look upon the female character as being a sort of natural deficiency. Accordingly while it is within the mother it develops slowly because of its coldness (for development is concoction, and it is heat that concocts, and what is hotter is easily concocted); but after birth it quickly arrives at maturity and old age on account of its weakness, for all inferior things come sooner to their perfection or end, and as this is true of works of art so it is of what is formed by Nature. For the reason just given also twins are less likely to survive in man if one be male and one female, but this is not at all so in the other animals; for in man it is contrary to Nature that they should run an equal course, as their development does not take place in equal periods, but the male must needs be too late or the female too early; in the other animals, however, it is not contrary to Nature. A difference is

also found between man and the other animals in respect of gestation, for animals are in better bodily condition most of the time, whereas in most women gestation is attended with discomfort. Their way of life is partly responsible for this, for being sedentary they are full of more residual matter; among nations where the women live a laborious life gestation is not equally conspicuous and those who are accustomed to work bear children easily both there and elsewhere; for work consumes the residual matter, but those who are sedentary have a great deal of it in them because not only is there no monthly discharge during pregnancy but also they do no work; therefore their travail is painful. But work exercises them so that they can hold their breath, upon which depends the ease or difficulty of child-birth. These circumstances then, as we have said, contribute to cause the difference between women and the other animals in this state, but the most important thing is this: in some animals the discharge corresponding to the catamenia is but small, and in some not visible at all, but in women it is greater than in any other animal, so that when this discharge ceases owing to pregnancy they are troubled (for if they are not pregnant they are afflicted with ailments whenever the catamenia do not occur); and they are more troubled as a rule at the beginning of pregnancy, for the embryo is able indeed to stop the catamenia but is too small at first to consume any quantity of the secretion; later on it takes up some of it and so alleviates the mother. In the other animals, on the contrary, the residual matter is but small and so corresponds with the growth of the foetus, and as the secretions which hinder nourishment are being consumed by the foetus the mother is in better bodily condition than usual. The same holds good also with aquatic animals and birds. If it ever happens that the body of the mother is no longer in good condition when the foetus is now becoming large, the reason is that its growth needs more nourishment than the residual matter supplies. (In some few

women it happens that the body is in a better state during pregnancy; these are women in whose body the residual matter is small so that it is all used up along with the nourishment that goes to the foetus.)

7

We must also speak of what is known as mola uteri, which occurs rarely in women but still is found sometimes during pregnancy. For they produce what is called a mola; it has happened before now to a woman, after she had had intercourse with her husband and supposed she had conceived, that at first the size of her belly increased and everything else happened accordingly, but yet when the time for birth came on, she neither bore a child nor was her size reduced, but she continued thus for three or four years until dysentery came on, endangering her life, and she produced a lump of flesh which is called mola. Moreover this condition may continue till old age and death. Such masses when expelled from the body become so hard that they can hardly be cut through even by iron. Concerning the cause of this phenomenon we have spoken in the Problems; the same thing happens to the embryo in the womb as to meats half cooked in roasting, and it is not due to heat, as some say, but rather to the weakness of the maternal heat. (For their nature seems to be incapable, and unable to perfect or to put the last touches to the process of generation. Hence it is that the mola remains in them till old age or at any rate for a long time, for in its nature it is neither perfect nor altogether a foreign body.) It is want of concoction that is the reason of its hardness, as with half-cooked meat, for this half-dressing of meat is also a sort of want of concoction.

A difficulty is raised as to why this does not occur in other animals, unless indeed it does occur and has entirely escaped observation. We must suppose the reason to be that woman alone among animals is subject to troubles of the uterus, and alone has a superfluous amount of catamenia and is unable to concoct them; when, then, the embryo has been formed of a liquid hard to concoct, then comes the so-called mola into being, and this happens naturally in women alone or at any rate more than in other animals.

8

Milk is formed in the females of all internally viviparous animals, becoming useful for the time of birth. For Nature has made it for the sake of the nourishment of animals after birth, so that it may neither fail at this time at all nor yet be at all superfluous; this is just what we find happening, unless anything chance contrary to Nature. In the other animals the period of gestation does not vary, and so the milk is concocted in time to suit this moment, but in man, since there are several times of birth, it must be ready at the first of these; hence in women the milk is useless before the seventh month and only then becomes useful. That it is only concocted at the last stages is what we should expect to happen also as being due to a necessary cause. For at first such residual matter when secreted is used up for the development of the embryo; now the nutritious part in all things is the sweetest and the most concocted, and thus when all such elements are removed what remains must become of necessity bitter and ill-flavoured. As the embryo is perfecting, the residual matter left over increases in quantity because the part consumed by the embryo is less; it is also sweeter since the easily concocted part is less drawn

away from it. For it is no longer expended on moulding the embryo but only on slightly increasing its growth, it being now fixed because it has reached perfection (for in a sense there is a perfection even of an embryo). Therefore it comes forth from the mother and changes its mode of development, as now possessing what belongs to it; and no longer takes that which does not belong to it; and it is at this season that the milk becomes useful.

The milk collects in the upper part of the body and the breasts because of the original plan of the organism. For the part above the hypozoma is the sovereign part of the animal, while that below is concerned with nourishment and residual matter, in order that all animals which move about may contain within themselves nourishment enough to make them independent when they move from one place to another. From this upper part also is produced the generative secretion for the reason mentioned in the opening of our discussion. But both the secretion of the male and the catamenia of the female are of a sanguineous nature, and the first principle of this blood and of the blood-vessels is the heart, and the heart is in this part of the body. Therefore it is here that the change of such a secretion must first become plain. This is why the voice changes in both sexes when they begin to bear seed (for the first principle of the voice resides there, and is itself changed when its moving cause changes). At the same time the parts about the breasts are raised visibly even in males but still more in females, for the region of the breasts becomes empty and spongy in them because so much material is drained away below. This is so not only in women but also in those animals which have the mammae low down.

This change in the voice and the parts about the mammae is plain even in other creatures to those who have experience of each kind of animal, but is most remarkable in man. The reason

is that in man the production of secretion is greatest in both sexes in proportion to their size as compared with other animals; I mean that of the catamenia in women and the emission of semen in men. When, therefore, the embryo no longer takes up the secretion in question but yet prevents its being discharged from the mother, it is necessary that the residual matter should collect in all those empty parts which are set upon the same passages. And such is the position of the mammae in each kind of animals for both causes; it is so both for the sake of what is best and of necessity.

It is here, then, that the nourishment in animals is now formed and becomes thoroughly concocted. As for the cause of concoction, we may take that already given, or we may take the opposite, for it is a reasonable view also that the embryo being larger takes more nourishment, so that less is left over about this time, and the less is concocted more quickly.

That milk has the same nature as the secretion from which each animal is formed is plain, and has been stated previously. For the material which nourishes is the same as that from which Nature forms the animal in generation. Now this is the sanguineous liquid in the sanguinea, and milk is blood concocted (not corrupted; Empedocles either mistook the fact or made a bad metaphor when he composed the line: 'On the tenth day of the eighth month the milk comes into being, a white pus', for putrefaction and concoction are opposite things, and pus is a kind of putrefaction but milk is concocted). While women are suckling children the catamenia do not occur according to Nature, nor do they conceive; if they do conceive, the milk dries up. This is because the nature of the milk and of the catamenia is the same, and Nature cannot be so productive as to supply both at once; if the secretion is diverted in the one direction it must needs cease in the other, unless some violence is done contrary to the general rule. But this is as much as to

say that it is contrary to Nature, for in all cases where it is not impossible for things to be otherwise than they generally are but where they may so happen, still what is the general rule is what is 'according to Nature'.

The time also at which the young animal is born has been well arranged. For when the nourishment coming through the umbilical cord is no longer sufficient for the foetus because of its size, then at the same time the milk becomes useful for the nourishment of the newly-born animal, and the blood-vessels round which the so-called umbilical cord lies as a coat collapse as the nourishment is no longer passing through it; for these reasons it is at that time also that the young animal enters into the world.

9

The natural birth of all animals is head-foremost, because the parts above the umbilical cord are larger than those below. The body then, being suspended from the cord as in a balance, inclines towards the heavy end, and the larger parts are the heavier.

10

The period of gestation is, as a matter of fact, determined generally in each animal in proportion to the length of its life. This we should expect, for it is reasonable that the development of the long-lived animals should take a longer time. Yet this is not the cause of it, but the periods only correspond accidentally

for the most part; for though the larger and more perfect sanguinea do live a long time, yet the larger are not all longer-lived. Man lives a longer time than any animal of which we have any credible experience except the elephant, and yet the human kind is smaller than that of the bushy-tailed animals and many others. The real cause of long life in any animal is its being tempered in a manner resembling the environing air, along with certain other circumstances of its nature, of which we will speak later; but the cause of the time of gestation is the size of the offspring. For it is not easy for large masses to arrive at their perfection in a small time, whether they be animals or, one may say, anything else whatever. That is why horses and animals akin to them, though living a shorter time than man, yet carry their young longer; for the time in the former is a year, but in the latter ten months at the outside. For the same reason also the time is long in elephants; they carry their young two years on account of their excessive size.

We find, as we might expect, that in all animals the time of gestation and development and the length of life aims at being measured by naturally complete periods. By a natural period I mean, e.g. a day and night, a month, a year, and the greater times measured by these, and also the periods of the moon, that is to say, the full moon and her disappearance and the halves of the times between these, for it is by these that the moon's orbit fits in with that of the sun [the month being a period common to both].

The moon is a first principle because of her connexion with the sun and her participation in his light, being as it were a second smaller sun, and therefore she contributes to all generation and development. For heat and cold varying within certain limits make things to come into being and after this to perish, and it is the motions of the sun and moon that fix the limit both of the beginning and of the end of these processes. Just as we see the

sea and all bodies of water settling and changing according to the movement or rest of the winds, and the air and winds again according to the course of the sun and moon, so also the things which grow out of these or are in these must needs follow suit. For it is reasonable that the periods of the less important should follow those of the more important. For in a sense a wind, too, has a life and birth and death.

As for the revolutions of the sun and moon, they may perhaps depend on other principles. It is the aim, then, of Nature to measure the coming into being and the end of animals by the measure of these higher periods, but she does not bring this to pass accurately because matter cannot be easily brought under rule and because there are many principles which hinder generation and decay from being according to Nature, and often cause things to fall out contrary to Nature.

We have now spoken of the nourishment of animals within the mother and of their birth into the world, both of each kind separately and of all in common.

Book V

1

We must now investigate the qualities by which the parts of animals differ. I mean such qualities of the parts as blueness and blackness in the eyes, height and depth of pitch in the

voice, and differences in colour whether of the skin or of hair and feathers. Some such qualities are found to characterize the whole of a kind of animals sometimes, while in other kinds they occur at random, as is especially the case in man. Further, in connexion with the changes in the time of life, all animals are alike in some points, but are opposed in others as in the case of the voice and the colour of the hair, for some do not grow grey visibly in old age, while man is subject to this more than any other animal. And some of these affections appear immediately after birth, while others become plain as age advances or in old age.

Now we must no longer suppose that the cause of these and all such phenomena is the same. For whenever things are not the product of Nature working upon the animal kingdom as a whole, nor yet characteristic of each separate kind, then none of these things is such as it is or is so developed for any final cause. The eye for instance exists for a final cause, but it is not blue for a final cause unless this condition be characteristic of the kind of animal. In fact in some cases this condition has no connexion with the essence of the animal's being, but we must refer the causes to the material and the motive principle or efficient cause, on the view that these things come into being by Necessity. For, as was said originally in the outset of our discussion, when we are dealing with definite and ordered products of Nature, we must not say that each is of a certain quality because it becomes so, but rather that they become so and so because they are so and so, for the process of Becoming or development attends upon Being and is for the sake of Being, not vice versa.

The ancient Nature-philosophers however took the opposite view. The reason of this is that they did not see that the causes were numerous, but only saw the material and efficient and did

not distinguish even these, while they made no inquiry at all into the formal and final causes.

Everything then exists for a final cause, and all those things which are included in the definition of each animal, or which either are means to an end or are ends in themselves, come into being both through this cause and the rest. But when we come to those things which come into being without falling under the heads just mentioned, their course must be sought in the movement or process of coming into being, on the view that the differences which mark them arise in the actual formation of the animal. An eye, for instance, the animal must have of necessity (for the fundamental idea of the animal is of such a kind), but it will have an eye of a particular kind of necessity in another sense, not the sense mentioned just above, because it is its nature to act or be acted on in this or that way.

These distinctions being drawn let us speak of what comes next in order. As soon then as the offspring of all animals are born, especially those born imperfect, they are in the habit of sleeping, because they continue sleeping also within the mother when they first acquire sensation. But there is a difficulty about the earliest period of development, whether the state of wakefulness exists in animals first, or that of sleep. Since they plainly wake up more as they grow older, it is reasonable to suppose that the opposite state, that of sleep, exists in the first stages of development. Moreover the change from not being to being must pass through the intermediate condition, and sleep seems to be in its nature such a condition, being as it were a boundary between living and not living, and the sleeper being neither altogether non-existent nor yet existent. For life most of all appertains to wakefulness, on account of sensation. But on the other hand, if it is necessary that the animal should have sensation and if it is then first an animal when it has acquired sensation, we ought to consider the original condition to be not

sleep but only something resembling sleep, such a condition as we find also in plants, for indeed at this time animals do actually live the life of a plant. But it is impossible that plants should sleep, for there is no sleep which cannot be broken, and the condition in plants which is analogous to sleep cannot be broken.

It is necessary then for the embryo animal to sleep most of the time because the growth takes place in the upper part of the body, which is consequently heavier (and we have stated elsewhere that such is the cause of sleep). But nevertheless they are found to wake even in the womb (this is clear in dissections and in the ovipara), and then they immediately fall into a sleep again. This is why after birth also they spend most of their time in sleep.

When awake infants do not laugh, but while asleep they both laugh and cry. For animals have sensations even while asleep, not only what are called dreams but also others besides dreams, as those persons who arise while sleeping and do many things without dreaming. For there are some who get up while sleeping and walk about seeing just like those who are awake; these have perception of what is happening, and though they are not awake, yet this perception is not like a dream. So infants presumably have sense-perception and live in their sleep owing to previous habit, being as it were without knowledge of the waking state. As time goes on and their growth is transferred to the lower part of the body, they now wake up more and spend most of their time in that condition. Children continue asleep at first more than other animals, for they are born in a more imperfect condition than other animals that are produced in anything like a perfect state, and their growth has taken place more in the upper part of the body.

The eyes of all children are bluish immediately after birth; later on they change to the colour which is to be theirs permanently. But in the case of other animals this is not visible. The reason of this is that the eyes of other animals are more apt to have only one colour for each kind of animal; e.g. cattle are dark-eyed, the eye of all sheep is pale, of others again the whole kind is blue or grey-eyed, and some are yellow (goat-eyed), as the majority of goats themselves, whereas the eyes of men happen to be of many colours, for they are blue or grey or dark in some cases and yellow in others. Hence, as the individuals in other kinds of animals do not differ from one another in the colour, so neither do they differ from themselves, for they are not of a nature to have more than one colour. Of the other animals the horse has the greatest variety of colour in the eye, for some of them are actually heteroglaucous; this phenomenon is not to be seen in any of the other animals, but man is sometimes heteroglaucous.

Why then is it that there is no visible change in the other animals if we compare their condition when newly born with their condition at a more advanced age, but that there is such a change in children? We must consider just this to be a sufficient cause, that the part concerned has only one colour in the former but several colours in the latter. And the reason why the eyes of infants are bluish and have no other colour is that the parts are weaker in the newly born and blueness is a sort of weakness.

We must also gain a general notion about the difference in eyes, for what reason some are blue, some grey, some yellow, and some dark. To suppose that the blue are fiery, as Empedocles says, while the dark have more water than fire in them, and that this is why the former, the blue, have not keen sight by day, viz. owing to deficiency of water in their composition, and the latter are in like condition by night, viz. owing to deficiency of

fire – this is not well said if indeed we are to assume sight to be connected with water, not fire, in all cases. Moreover it is possible to render another account of the cause of the colours, but if indeed the fact is as was stated before in the treatise on the senses, and still earlier than that in the investigations concerning soul – if this sense organ is composed of water and if we were right in saying for what reason it is composed of water and not of air or fire – then we must assume the water to be the cause of the colours mentioned. For some eyes have too much liquid to be adapted to the movement, others have too little, others the due amount. Those eyes therefore in which there is much liquid are dark because much liquid is not transparent, those which have little are blue; (so we find in the sea that the transparent part of it appears light blue, the less transparent watery, and the unfathomable water is dark or deep-blue on account of its depth). When we come to the eyes between these, they differ only in degree.

We must suppose the same cause also to be responsible for the fact that blue eyes are not keen-sighted by day nor dark eyes by night. Blue eyes, because there is little liquid in them, are too much moved by the light and by visible objects in respect of their liquidity as well as their transparency, but sight is the movement of this part in so far as it is transparent, not in so far as it is liquid. Dark eyes are less moved because of the quantity of liquid in them. And so they see less well in the dusk, for the nocturnal light is weak; at the same time also liquid is in general hard to move in the night. But if the eye is to see, it must neither not be moved at all nor yet more than in so far as it is transparent, for the stronger movement drives out the weaker. Hence it is that on changing from strong colours, or on going out of the sun into the dark, men cannot see, for the motion already existing in the eye, being strong, stops that from outside, and in general neither a strong nor a weak sight can

see bright things because the liquid is acted upon and moved too much.

The same thing is shown also by the morbid affections of each kind of sight. Cataract attacks the blue-eyed more, but what is called 'nyctalopia' the dark-eyed. Now cataract is a sort of dryness of the eyes and therefore it is found more in the aged, for this part also like the rest of the body gets dry towards old age; but is an excess of liquidity and so is found more in the younger, for their brain is more liquid.

The sight of the eye which is intermediate between too much and too little liquid is the best, for it has neither too little so as to be disturbed and hinder the movement of the colours, nor too much so as to cause difficulty of movement.

Not only the above-mentioned facts are causes of seeing keenly or the reverse, but also the nature of the skin upon what is called the pupil. This ought to be transparent, and it is necessary that the transparent should be thin and white and even, thin that the movement coming from without may pass straight through it, even that it may not cast a shade the liquid behind it by wrinkling (for this also is a reason why old men have not keen sight, the skin of the eye like the rest of the skin wrinkling and becoming thicker in old age), and white because black is not transparent, for that is just what is meant by 'black', what is not shone through, and that is why lanterns cannot give light if they be made of black skin. It is for these reasons then that the sight is not keen in old age nor in the diseases in question, but it is because of the small amount of liquid that the eyes of children appear blue at first.

And the reason why men especially and horses occasionally are heteroglaucous is the same as the reason why man alone grows grey and the horse is the only other animal whose hairs whiten visibly in old age. For greyness is a weakness of the fluid in the

brain and an incapacity to concoct properly, and so is blueness of the eyes; excess of thinness or of thickness produces the same effect, according as this liquidity is too little or too much. Whenever then Nature cannot make the eyes correspond exactly, either by concocting or by not concocting the liquid in both, but concocts the one and not the other, then the result is heteroglaucia.

The cause of some animals being keen-sighted and others not so is not simple but double. For the word ‘keen’ has pretty much a double sense (and this is the case in like manner with hearing and smelling). In one sense keen sight means the power of seeing at a distance, in another it means the power of distinguishing as accurately as possible the objects seen. These two faculties are not necessarily combined in the same individual. For the same person, if he shades his eyes with his hand or look through a tube, does not distinguish the differences of colour either more or less in any way, but he will see further; in fact, men in pits or wells sometimes see the stars. Therefore if any animal’s brows project far over the eye, but if the liquid in the pupil is not pure nor suited to the movement coming from external objects and if the skin over the surface is not thin, this animal will not distinguish accurately the differences of the colours but it will be able to see from a long distance (just as it can from a short one) better than those in which the liquid and the covering membrane are pure but which have no brows projecting over the eyes. For the cause of seeing keenly in the sense of distinguishing the differences is in the eye itself; as on a clean garment even small stains are visible, so also in a pure sight even small movements are plain and cause sensation. But it is the position of the eyes that is the cause of seeing things far off and of the movements in the transparent medium coming to the eyes from distant objects. A proof of this is that animals with prominent eyes do not see well at a distance, whereas those which have their eyes lying

deep in the head can see things at a distance because the movement is not dispersed in space but comes straight to the eye. For it makes no difference whether we say, as some do, that seeing is caused by the sight going forth from the eye – on that view, if there is nothing projecting over the eyes, the sight must be scattered and so less of it will fall on the objects of vision and things at a distance will not be seen so well – or whether we say that seeing is due to the movement coming from the objects; for the sight also must see, in a manner resembling the movement. Things at a distance, then, would be seen best if there were, so to say, a continuous tube straight from the sight to its object, for the movement from the object would not then be dissipated; but, if that is impossible, still the further the tube extends the more accurately must distant objects be seen.

Let these, then, be given as the causes of the difference in eyes.

2

It is the same also with hearing and smell; to hear and smell accurately mean in one sense to perceive as precisely as possible all the distinctions of the objects of perception, in another sense to hear and smell far off. As with sight, so here the sense-organ is the cause of judging well the distinctions, if both that organ itself and the membrane round it be pure. For the passages of all the sense-organs, as has been said in the treatise on sensation, run to the heart, or to its analogue in creatures that have no heart. The passage of the hearing, then, since this sense-organ is of air, ends at the place where the innate spiritus causes in some animals the pulsation of the heart and in others respiration; wherefore also it is that we are able to understand what is said and repeat what we have heard,

for as was the movement which entered through the sense-organ, such again is the movement which is caused by means of the voice, being as it were of one and the same stamp, so that a man can say what he has heard. And we hear less well during a yawn or expiration than during inspiration, because the starting-point of the sense-organ of hearing is set upon the part concerned with breathing and is shaken and moved as the organ moves the breath, for while setting the breath in motion it is moved itself. The same thing happens in wet weather or a damp atmosphere.... And the ears seemed to be filled with air because their starting-point is near the region of breathing.

Accuracy then in judging the differences of sounds and smells depends on the purity of the sense-organ and of the membrane lying upon its surface, for then all the movements become clear in such cases, as in the case of sight. Perception and non-perception at a distance also depend on the same things with hearing and smell as with sight. For those animals can perceive at a distance which have channels, so to say, running through the parts concerned and projecting far in front of the sense-organs. Therefore all animals whose nostrils are long, as the Laconian hounds, are keen-scented, for the sense-organ being above them, the movements from a distance are not dissipated but go straight to the mark, just as the movements which cause sight do with those who shadow the eyes with the hand.

Similar is the case of animals whose ears are long and project far like the eaves of a house, as in some quadrupeds, with the internal spiral passage long; these also catch the movement from afar and pass it on to the sense-organ.

In respect of sense-perception at a distance, man is, one may say, the worst of all animals in proportion to his size, but in respect of judging the differences of quality in the objects he is the best of all. The reason is that the sense-organ in man is pure

and least earthy and material, and he is by nature the thinnest-skinned of all animals for his size.

The workmanship of Nature is admirable also in the seal, for though a viviparous quadruped it has no ears but only passages for hearing. This is because its life is passed in the water; now the ear is a part added to the passages to preserve the movement of the air at a distance; therefore an ear is no use to it but would even bring about the contrary result by receiving a mass of water into itself.

We have thus spoken of sight, hearing, and smell.

3

As for hair, men differ in this themselves at different ages, and also from all other kinds of animals that have hair. These are almost all which are internally viviparous, for even when the covering of such animals is spiny it must be considered as a kind of hair, as in the land hedgehog and any other such animal among the vivipara. Hairs differ in respect of hardness and softness, length and shortness, straightness and curliness, quantity and scantiness, and in addition to these qualities, in their colours, whiteness and blackness and the intermediate shades. They differ also in some of these respects according to age, as they are young or growing old. This is especially plain in man; the hair gets coarser as time goes on, and some go bald on the front of the head; children indeed do not go bald, nor do women, but men do so by the time their age is advancing. Human beings also go grey on the head as they grow old, but this is not visible in practically any other animal, though more so in the horse than others. Men go bald on the front of the head, but turn grey first on the temples; no one goes bald first

on these or on the back of the head. Some such affections occur in a corresponding manner also in all animals which have not hair but something analogous to it, as the feathers of birds and scales in the class of fish.

For what purpose Nature has made hair in general for animals has been previously stated in the work dealing with the causes of the parts of animals; it is the business of the present inquiry to show under what circumstances and for what necessary causes each particular kind of hair occurs. The principal cause then of thickness and thinness is the skin, for this is thick in some animals and thin in others, rare in some and dense in others. The different quality of the included moisture is also a helping cause, for in some animals this is greasy and in others watery. For generally speaking the substratum of the skin is of an earthy nature; being on the surface of the body it becomes solid and earthy as the moisture evaporates. Now the hairs or their analogue are not formed out of the flesh but out of the skin moisture evaporating and exhaling in them, and therefore thick hairs arise from a thick skin and thin from thin. If then the skin is rarer and thicker, the hairs are thick because of the quantity of earthy matter and the size of the pores, but if it is denser they are thin because of the narrowness of the pores. Further, if the moisture be watery it dries up quickly and the hairs do not gain in size, but if it be greasy the opposite happens, for the greasy is not easily dried up. Therefore the thicker-skinned animals are as a general rule thicker-haired for the causes mentioned; however, the thickest-skinned are not more so than other thick-skinned ones, as is shown by the class of swine compared to that of oxen and to the elephant and many others. And for the same reason also the hairs of the head in man are thickest, for this part of his skin is thickest and lies over most moisture and besides is very porous.

The cause of the hairs being long or short depends on the evaporating moisture not being easily dried. Of this there are two causes, quantity and quality; if the liquid is much it does not dry up easily nor if it is greasy. And for this reason the hairs of the head are longest in man, for the brain, being fluid and cold, supplies great abundance of moisture.

The hairs become straight or curly on account of the vapour arising in them. If it be smoke-like, it is hot and dry and so makes the hair curly, for it is twisted as being carried with a double motion, the earthy part tending downwards and the hot upwards. Thus, being easily bent, it is twisted owing to its weakness, and this is what is meant by curliness in hair. It is possible then that this is the cause, but it is also possible that, owing to its having but little moisture and much earthy matter in it, it is dried by the surrounding air and so coiled up together. For what is straight becomes bent, if the moisture in it is evaporated, and runs together as a hair does when burning upon the fire; curliness will then be a contraction owing to deficiency of moisture caused by the heat of the environment. A sign of this is the fact that curly hair is harder than straight, for the dry is hard. And animals with much moisture are straight-haired; for in these hairs the moisture advances as a stream, not in drops. For this reason the Scythians on the Black Sea and the Thracians are straight-haired, for both they themselves and the environing air are moist, whereas the Aethiopians and men in hot countries are curly-haired, for their brains and the surrounding air are dry.

Some, however, of the thick-skinned animals are fine-haired for the cause previously stated, for the finer the pores are the finer must the hairs be. Hence the class of sheep have such hairs (for wool is only a multitude of hairs).

There are some animals whose hair is soft and yet less fine, as is the case with the class of hares compared with that of sheep; in such animals the hair is on the surface of the skin, not deeply rooted in it, and so is not long but in much the same state as the scrapings from linen, for these also are not long but are soft and do not admit of weaving.

The condition of sheep in cold climates is opposite to that of man; the hair of the Scythians is soft but that of the Sauromatic sheep is hard. The reason of this is the same as it is also all wild animals. The cold hardens and solidifies them by drying them, for as the heat is pressed out the moisture evaporates, and both hair and skin become earthy and hard. In wild animals then the exposure to the cold is the cause of hardness in the hair, in the others the nature of the climate is the cause. A proof of this is also what happens in the sea-urchins which are used as a remedy in stranguries. For these, too, though small themselves, have large and hard spines because the sea in which they live is cold on account of its depth (for they are found in sixty fathoms and even more). The spines are large because the growth of the body is diverted to them, since having little heat in them they do not concoct their nutriment and so have much residual matter and it is from this that spines, hairs, and such things are formed; they are hard and petrified through the congealing effect of the cold. In the same way also plants are found to be harder, more earthy, and stony, if the region in which they grow looks to the north than if it looks to the south, and those in windy places than those in sheltered, for they are all more chilled and their moisture evaporates.

Hardening, then, comes of both heat and cold, for both cause the moisture to evaporate, heat per se and cold per accidens (since the moisture goes out of things along with the heat, there being no moisture without heat), but whereas cold not only hardens but also condenses, heat makes a substance rarer.

For the same reason, as animals grow older, the hairs become harder in those which have hairs, and the feathers and scales in the feathered and scaly kinds. For their skins become harder and thicker as they get older, for they are dried up, and old age, as the word denotes, is earthy because the heat fails and the moisture along with it.

Men go bald visibly more than any other animal, but still such a state is something general, for among plants also some are evergreens while others are deciduous, and birds which hibernate shed their feathers. Similar to this is the condition of baldness in those human beings to whom it is incident. For leaves are shed by all plants, from one part of the plant at a time, and so are feathers and hairs by those animals that have them; it is when they are all shed together that the condition is described by the terms mentioned, for it is called 'going bald' and 'the fall of the leaf' and 'moulting'. The cause of the condition is deficiency of hot moisture, such moisture being especially the unctuous, and hence unctuous plants are more evergreen. (However we must elsewhere state the cause of this phenomena in plants, for other causes also contribute to it.) It is in winter that this happens to plants (for the change from summer to winter is more important to them than the time of life), and to those animals which hibernate (for these, too, are by nature less hot and moist than man); in the latter it is the seasons of life that correspond to summer and winter. Hence no one goes bald before the time of sexual intercourse, and at that time it is in those naturally inclined to such intercourse that baldness appears, for the brain is naturally the coldest part of the body and sexual intercourse makes men cold, being a loss of pure natural heat. Thus we should expect the brain to feel the effect of it first, for a little cause turns the scale where the thing concerned is weak and in poor condition. Thus if we reckon up these points, that the brain itself has but little heat, and further that the skin round it must needs have still less, and again that

the hair must have still less than the skin inasmuch as it is furthest removed from the brain, we should reasonably expect baldness to come about this age upon those who have much semen. And it is for the same reason that the front part of the head alone goes bald in man and that he is the only animal to do so; the front part goes bald because the brain is there, and man is the only animal to go bald because his brain is much the largest and the moistest. Women do not go bald because their nature is like that of children, both alike being incapable of producing seminal secretion. Eunuchs do not become bald, because they change into the female condition. And as to the hair that comes later in life, eunuchs either do not grow it at all, or lose it if they happen to have it, with the exception of the pubic hair; for women also grow that though they have not the other, and this mutilation is a change from the male to the female condition.

The reason why the hair does not grow again in cases of baldness, although both hibernating animals recover their feathers or hair and trees that have shed their leaves grow leaves again, is this. The seasons of the year are the turning-points of their lives, rather than their age, so that when these seasons change they change with them by growing and losing feathers, hairs, or leaves respectively. But the winter and summer, spring and autumn of man are defined by his age, so that, since his ages do not return, neither do the conditions caused by them return, although the cause of the change of condition is similar in man to what it is in the animals and plants in question.

We have now spoken pretty much of all the other conditions of hair.

4

But as to their colour, it is the nature of the skin that is the cause of this in other animals and also of their being uni-coloured or vari-coloured); but in man it is not the cause, except of the hair going grey through disease (not through old age), for in what is called leprosy the hairs become white; on the contrary, if the hairs are white the whiteness does not invade the skin. The reason is that the hairs grow out of skin; if, then, the skin is diseased and white the hair becomes diseased with it, and the disease of hair is greyness. But the greyness of hair which is due to age results from weakness and deficiency of heat. For as the body declines in vigour we tend to cold at every time of life, and especially in old age, this age being cold and dry. We must remember that the nutriment coming to each part of the body is concocted by the heat appropriate to the part; if the heat is inadequate the part loses its efficiency, and destruction or disease results. (We shall speak more in detail of causes in the treatise on growth and nutrition.) Whenever, then, the hair in man has naturally little heat and too much moisture enters it, its own proper heat is unable to concoct the moisture and so it is decayed by the heat in the environing air. All decay is caused by heat, not the innate heat but external heat, as has been stated elsewhere. And as there is a decay of water, of earth, and all such material bodies, so there is also of the earthy vapour, for instance what is called mould (for mould is a decay of earthy vapour). Thus also the liquid nutriment in the hair decays because it is not concocted, and what is called greyness results. It is white because mould also, practically alone among decayed things, is white. The reason of this is that it has much air in it, all earthy vapour being equivalent to thick air. For mould is, as it were, the antithesis of hoar-frost; if the ascending vapour be frozen it becomes hoar-frost, if it be decayed, mould. Hence both are on the surface of things, for vapour is superficial. And so the comic poets make a good metaphor in

jest when they call grey hairs 'mould of old age' and For the one is generically the same as greyness, the other specifically; hoar-frost generically (for both are a vapour), mould specifically (for both are a form of decay). A proof that this is so is this: grey hairs have often grown on men in consequence of disease, and later on dark hairs instead of them after restoration to health. The reason is that in sickness the whole body is deficient in natural heat and so the parts besides, even the very small ones, participate in this weakness; and again, much residual matter is formed in the body and all its parts in illness, wherefore the incapacity in the flesh to concoct the nutriment causes the grey hairs. But when men have recovered health and strength again they change, becoming as it were young again instead of old; in consequence the states change also. Indeed, we may rightly call disease an acquired old age, old age a natural disease; at any rate, some diseases produce the same effects as old age.

Men go grey on the temples first, because the back of the head is empty of moisture owing to its containing no brain, and the 'bregma' has a great deal of moisture, a large quantity not being liable to decay; the hair on the temples however has neither so little that it can concoct it nor so much that it cannot decay, for this region of the head being between the two extremes is exempt from both states. The cause of greyness in man has now been stated.

5

The reason why this change does not take place visibly on account of age in other animals is the same as that already given in the case of baldness; their brain is small and less fluid than in man, so that the heat required for concoction does not

altogether fail. Among them it is most clear in horses of all animals that we know, because the bone about the brain is thinner in them than in others in proportion to their size. A sign of this is that a blow to this spot is fatal to them, wherefore Homer also has said: 'where the first hairs grow on the skull of horses, and a wound is most fatal.' As then the moisture easily flows to these hairs because of the thinness of the bone, whilst the heat fails on account of age, they go grey. The reddish hairs go grey sooner than the black, redness also being a sort of weakness of hair and all weak things ageing sooner. It is said, however, that cranes become darker as they grow old. The reason of this would be, if it should prove true, that their feathers are naturally moister than others and as they grow old the moisture in the feathers is too much to decay easily.

Greyness comes about by some sort of decay, and is not, as some think, a withering. (1) A proof of the former statement is the fact that hair protected by hats or other coverings goes grey sooner (for the winds prevent decay and the protection keeps off the winds), and the fact that it is aided by anointing with a mixture of oil and water. For, though water cools things, the oil mingled with it prevents the hair from drying quickly, water being easily dried up. (2) That the process is not a withering, that the hair does not whiten as grass does by withering, is shown by the fact that some hairs grow grey from the first, whereas nothing springs up in a withered state. Many hairs also whiten at the tip, for there is least heat in the extremities and thinnest parts.

When the hairs of other animals are white, this is caused by nature, not by any affection. The cause of the colours in other animals is the skin; if they are white, the skin is white, if they are dark it is dark, if they are piebald in consequence of a mixture of the hairs, it is found to be white in the one part and dark in the other. But in man the skin is in no way the cause, for

even white-skinned men have very dark hair. The reason is that man has the thinnest skin of all animals in proportion to his size and therefore it has not strength to change the hairs; on the contrary the skin itself changes its colour through its weakness and is darkened by sun and wind, while the hairs do not change along with it at all. But in the other animals the skin, owing to its thickness, has the influence belonging to the soil in which a thing grows, therefore the hairs change according to the skin but the skin does not change at all in consequence of the winds and the sun.

6

Of animals some are uni-coloured (I mean by this term those of which the kind as a whole has one colour, as all lions are tawny; and this condition exists also in birds, fish, and the other classes of animals alike); others though many-coloured are yet whole-coloured (I mean those whose body as a whole has the same colour, as a bull is white as a whole or dark as a whole); others are vari-coloured. This last term is used in both ways; sometimes the whole kind is vari-coloured, as leopards and peacocks, and some fish, e.g. the so-called 'thrattai'; sometimes the kind as a whole is not so, but such individuals are found in it, as with cattle and goats and, among birds, pigeons; the same applies also to other kinds of birds. The whole-coloured change much more than the uniformly coloured, both into the simple colour of another individual of the same kind (as dark changing into white and vice versa) and into both colours mingled. This is because it is a natural characteristic of the kind as a whole not to have one colour only, the kind being easily moved in both directions so that the colours both change more into one another and are more varied. The opposite holds with the

uniformly coloured; they do not change except by an affection of the colour, and that rarely; but still they do so change, for before now white individuals have been observed among partridges, ravens, sparrows, and bears. This happens when the course of development is perverted, for what is small is easily spoilt and easily moved, and what is developing is small, the beginning of all such things being on a small scale.

Change is especially found in those animals of which by nature the individual is whole-coloured but the kind many-coloured. This is owing to the water which they drink, for hot waters make the hair white, cold makes it dark, an effect found also in plants. The reason is that the hot have more air than water in them, and the air shining through causes whiteness, as also in froth. As, then, skins which are white by reason of some affection differ from those white by nature, so also in the hair the whiteness due to disease or age differs from that due to nature in that the cause is different; the latter are whitened by the natural heat, the former by the external heat. Whiteness is caused in all things by the vaporous air imprisoned in them. Hence also in all animals not uniformly coloured all the part under the belly is whiter. For practically all white animals are both hotter and better flavoured for the same reason; the concoction of their nutriment makes them well-flavoured, and heat causes the concoction. The same cause holds for those animals which are uniformly-coloured, but either dark or white; heat and cold are the causes of the nature of the skin and hair, each of the parts having its own special heat.

The tongue also varies in colour in the simply coloured as compared with the vari-coloured animals, and again in the simply coloured which differ from one another, as white and dark. The reason is that assigned before, that the skins of the vari-coloured are vari-coloured, and the skins of the white-haired and dark-haired are white and dark in each case. Now

we must conceive of the tongue as one of the external parts, not taking into account the fact that it is covered by the mouth but looking on it as we do on the hand or foot; thus since the skin of the vari-coloured animals is not uniformly coloured, this is the cause of the skin on the tongue being also vari-coloured.

Some birds and some wild quadrupeds change their colour according to the seasons of the year. The reason is that, as men change according to their age, so the same thing happens to them according to the season; for this makes a greater difference to them than the change of age.

The more omnivorous animals are more vari-coloured to speak generally, and this is what might be expected; thus bees are more uniformly coloured than hornets and wasps. For if the food is responsible for the change we should expect varied food to increase the variety in the movements which cause the development and so in the residual matter of the food, from which come into being hairs and feathers and skins.

So much for colours and hairs.

7

As to the voice, it is deep in some animals, high in others, in others again well-pitched and in due proportion between both extremes. Again, in some it is loud, in others small, and it differs in smoothness and roughness, flexibility and inflexibility. We must inquire then into the causes of each of these distinctions.

We must suppose then that the same cause is responsible for high and deep voices as for the change which they undergo in passing from youth to age. The voice is higher in all other

animals when younger, but in cattle that of calves is deeper. We find the same thing also in the male and female sexes; in the other kinds of animals the voice of the female is higher than that of the male (this being especially plain in man, for Nature has given this faculty to him in the highest degree because he alone of animals makes use of speech and the voice is the material of speech), but in cattle the opposite obtains, for the voice of cows is deeper than that of bulls.

Now the purpose for which animals have a voice, and what is meant by 'voice' and by 'sound' generally, has been stated partly in the treatise on sensation, partly in that on the soul. But since lowness of voice depends on the movement of the air being slow and its highness on its being quick, there is a difficulty in knowing whether it is that which moves or that which is moved that is the cause of the slowness or quickness. For some say that what is much is moved slowly, what is little quickly, and that the quantity of the air is the cause of some animals having a deep and others a high voice. Up to a certain point this is well said (for it seems to be rightly said in a general way that the depth depends on a certain amount of the air put in motion), but not altogether, for if this were true it would not be easy to speak both soft and deep at once, nor again both loud and high. Again, the depth seems to belong to the nobler nature, and in songs the deep note is better than the high-pitched ones, the better lying in superiority, and depth of tone being a sort of superiority. But then depth and height in the voice are different from loudness and softness, and some high-voiced animals are loud-voiced, and in like manner some soft-voiced ones are deep-voiced, and the same applies to the tones lying between these extremes. And by what else can we define these (I mean loudness and softness of voice) except by the large and small amount of the air put in motion? If then height and depth are to be decided in accordance with the distinction postulated, the result will be that the same animals will be deep-and loud-

voiced, and the same will be high – and not loud – voiced; but this is false.

The reason of the difficulty is that the words ‘great’ and ‘small’, ‘much’ and ‘little’ are used sometimes absolutely, sometimes relatively to one another. Whether an animal has a great (or loud) voice depends on the air which is moved being much absolutely, whether it has a small voice depends on its being little absolutely; but whether they have a deep or high voice depends on their being thus differentiated in relation to one another. For if that which is moved surpass the strength of that which moves it, the air that is sent forth must go slowly; if the opposite, quickly. The strong, then, on account of their strength, sometimes move much air and make the movement slow, sometimes, having complete command over it, make the movement swift. On the same principle the weak either move too much air for their strength and so make the movement slow, or if they make it swift move but little because of their weakness.

These, then, are the reasons of these contrarieties, that neither are all young animals high-voiced nor all deep-voiced, nor are all the older, nor yet are the two sexes thus opposed, and again that not only the sick speak in a high voice but also those in good bodily condition, and, further, that as men verge on old age they become higher-voiced, though this age is opposite to that of youth.

Most young animals, then, and most females set but little air in motion because of their want of power, and are consequently high-voiced, for a little air is carried along quickly, and in the voice what is quick is high. But in calves and cows, in the one case because of their age, in the other because of their female nature, the part by which they set the air in motion is not strong; at the same time they set a great quantity in motion and

so are deep-voiced; for that which is borne along slowly is heavy, and much air is borne along slowly. And these animals set much in movement whereas the others set but little, because the vessel through which the breath is first borne has in them a large opening and necessarily sets much air in motion, whereas in the rest the air is better dispensed. As their age advances this part which moves the air gains more strength in each animal, so that they change into the opposite condition, the high-voiced becoming deeper-voiced than they were, and the deep-voiced higher-voiced, which is why bulls have a higher voice than calves and cows. Now the strength of all animals is in their sinews, and so those in the prime of life are stronger, the young being weaker in the joints and sinews; moreover, in the young they are not yet tense, and in those now growing old the tension relaxes, wherefore both these ages are weak and powerless for movement. And bulls are particularly sinewy, even their hearts, and therefore that part by which they set the air in motion is in a tense state, like a sinewy string stretched tight. (That the heart of bulls is of such a nature is shown by the fact that a bone is actually found in some of them, and bones are naturally connected with sinew.)

All animals when castrated change to the female character, and utter a voice like that of the females because the sinewy strength in the principle of the voice is relaxed. This relaxation is just as if one should stretch a string and make it taut by hanging some weight on to it, as women do who weave at the loom, for they stretch the warp by attaching to it what are called 'laiai'. For in this way are the testes attached to the seminal passages, and these again to the blood-vessel which takes its origin in the heart near the organ which sets the voice in motion. Hence as the seminal passages change towards the age at which they are now able to secrete the semen, this part also changes along with them. As this changes, the voice again changes, more indeed in males, but the same thing happens in

females too, only not so plainly, the result being what some call 'bleating' when the voice is uneven. After this it settles into the deep or high voice of the succeeding time of life. If the testes are removed the tension of the passages relaxes, as when the weight is taken off the string or the warp; as this relaxes, the organ which moves the voice is loosened in the same proportion. This, then, is the reason why the voice and the form generally changes to the female character in castrated animals; it is because the principle is relaxed upon which depends the tension of the body; not that, as some suppose, the testes are themselves a ganglion of many principles, but small changes are the causes of great ones, not per se but when it happens that a principle changes with them. For the principles, though small in size, are great in potency; this, indeed, is what is meant by a principle, that it is itself the cause of many things without anything else being higher than it for it to depend upon.

The heat or cold also of their habitat contributes to make some animals of such a character as to be deep-voiced, and others high-voiced. For hot breath being thick causes depth, cold breath being thin the opposite. This is clear also in pipe-playing, for if the breath of the performer is hotter, that is to say if it is expelled as by a groan, the note is deeper.

The cause of roughness and smoothness in the voice, and of all similar inequality, is that the part or organ through which the voice is conveyed is rough or smooth or generally even or uneven. This is plain when there is any moisture about the trachea or when it is roughened by any affection, for then the voice also becomes uneven.

Flexibility depends on the softness or hardness of the organ, for what is soft can be regulated and assume any form, while what is hard cannot; thus the soft organ can utter a loud or a small note, and accordingly a high or a deep one, since it easily

regulates the breath, becoming itself easily great or small. But hardness cannot be regulated.

Let this be enough on all those points concerning the voice which have not been previously discussed in the treatise on sensation and in that on the soul.

8

With regard to the teeth it has been stated previously that they do not exist for a single purpose nor for the same purpose in all animals, but in some for nutrition only, in others also for fighting and for vocal speech. We must, however, consider it not alien to the discussion of generation and development to inquire into the reason why the front teeth are formed first and the grinders later, and why the latter are not shed but the former are shed and grow again.

Democritus has spoken of these questions but not well, for he assigns the cause too generally without investigating the facts in all cases. He says that the early teeth are shed because they are formed in animals too early, for it is when animals are practically in their prime that they grow according to Nature, and suckling is the cause he assigns for their being found too early. Yet the pig also suckles but does not shed its teeth, and, further, all the animals with carnivorous dentition suckle, but some of them do not shed any teeth except the canines, e.g. lions. This mistake, then, was due to his speaking generally without examining what happens in all cases; but this is what we to do, for any one who makes any general statement must speak of all the particular cases.

Now we assume, basing our assumption upon what we see, that Nature never fails nor does anything in vain so far as is possible in each case. And it is necessary, if an animal is to obtain food after the time of taking milk is over, that it should have instruments for the treatment of the food. If, then, as Democritus says, this happened about the time of reaching maturity, Nature would fail in something possible for her to do. And, besides, the operation of Nature would be contrary to Nature, for what is done by violence is contrary to Nature, and it is by violence that he says the formation of the first teeth is brought about. That this view then is not true is plain from these and other similar considerations.

Now these teeth are developed before the flat teeth, in the first place because their function is earlier (for dividing comes before crushing, and the flat teeth are for crushing, the others for dividing), in the second place because the smaller is naturally developed quicker than the larger, even if both start together, and these teeth are smaller in size than the grinders, because the bone of the jaw is flat in that part but narrow towards the mouth. From the greater part, therefore, must flow more nutriment to form the teeth, and from the narrower part less.

The act of sucking in itself contributes nothing to the formation of the teeth, but the heat of the milk makes them appear more quickly. A proof of this is that even in suckling animals those young which enjoy hotter milk grow their teeth quicker, heat being conducive to growth.

They are shed, after they have been formed, partly because it is better so (for what is sharp is soon blunted, so that a fresh relay is needed for the work, whereas the flat teeth cannot be blunted but are only smoothed in time by wearing down), partly from necessity because, while the roots of the grinders are fixed where the jaw is flat and the bone strong, those of the front

teeth are in a thin part, so that they are weak and easily moved. They grow again because they are shed while the bone is still growing and the animal is still young enough to grow teeth. A proof of this is that even the flat teeth grow for a long time, the last of them cutting the gum at about twenty years of age; indeed in some cases the last teeth have been grown in quite old age. This is because there is much nutriment in the broad part of the bones, whereas the front part being thin soon reaches perfection and no residual matter is found in it, the nutriment being consumed in its own growth.

Democritus, however, neglecting the final cause, reduces to necessity all the operations of Nature. Now they are necessary, it is true, but yet they are for a final cause and for the sake of what is best in each case. Thus nothing prevents the teeth from being formed and being shed in this way; but it is not on account of these causes but on account of the end (or final cause); these are causes only in the sense of being the moving and efficient instruments and the material. So it is reasonable that Nature should perform most of her operations using breath as an instrument, for as some instruments serve many uses in the arts, e.g. the hammer and anvil in the smith's art, so does breath in the living things formed by Nature. But to say that necessity is the only cause is much as if we should think that the water has been drawn off from a dropsical patient on account of the lancet, not on account of health, for the sake of which the lancet made the incision.

We have thus spoken of the teeth, saying why some are shed and grow again, and others not, and generally for what cause they are formed. And we have spoken of the other affections of the parts which are found to occur not for any final end but of necessity and on account of the motive or efficient cause.

Aristotle – Metaphysics

[Translated by W. D. Ross]

Book A

1

All men by nature desire to know. An indication of this is the delight we take in our senses; for even apart from their usefulness they are loved for themselves; and above all others the sense of sight. For not only with a view to action, but even when we are not going to do anything, we prefer seeing (one might say) to everything else. The reason is that this, most of all the senses, makes us know and brings to light many differences between things.

By nature animals are born with the faculty of sensation, and from sensation memory is produced in some of them, though not in others. And therefore the former are more intelligent and apt at learning than those which cannot remember; those which are incapable of hearing sounds are intelligent though they cannot be taught, e.g. the bee, and any other race of animals that may be like it; and those which besides memory have this sense of hearing can be taught.

The animals other than man live by appearances and memories, and have but little of connected experience; but the human race lives also by art and reasonings. Now from memory experience is produced in men; for the several memories of the same thing produce finally the capacity for a single experience. And experience seems pretty much like science and art, but

really science and art come to men through experience; for 'experience made art', as Polus says, 'but inexperience luck.' Now art arises when from many notions gained by experience one universal judgement about a class of objects is produced. For to have a judgement that when Callias was ill of this disease this did him good, and similarly in the case of Socrates and in many individual cases, is a matter of experience; but to judge that it has done good to all persons of a certain constitution, marked off in one class, when they were ill of this disease, e.g. to phlegmatic or bilious people when burning with fevers – this is a matter of art.

With a view to action experience seems in no respect inferior to art, and men of experience succeed even better than those who have theory without experience. (The reason is that experience is knowledge of individuals, art of universals, and actions and productions are all concerned with the individual; for the physician does not cure man, except in an incidental way, but Callias or Socrates or some other called by some such individual name, who happens to be a man. If, then, a man has the theory without the experience, and recognizes the universal but does not know the individual included in this, he will often fail to cure; for it is the individual that is to be cured.) But yet we think that knowledge and understanding belong to art rather than to experience, and we suppose artists to be wiser than men of experience (which implies that Wisdom depends in all cases rather on knowledge); and this because the former know the cause, but the latter do not. For men of experience know that the thing is so, but do not know why, while the others know the 'why' and the cause. Hence we think also that the masterworkers in each craft are more honourable and know in a truer sense and are wiser than the manual workers, because they know the causes of the things that are done (we think the manual workers are like certain lifeless things which act indeed, but act without knowing what they do, as fire burns, –

but while the lifeless things perform each of their functions by a natural tendency, the labourers perform them through habit); thus we view them as being wiser not in virtue of being able to act, but of having the theory for themselves and knowing the causes. And in general it is a sign of the man who knows and of the man who does not know, that the former can teach, and therefore we think art more truly knowledge than experience is; for artists can teach, and men of mere experience cannot.

Again, we do not regard any of the senses as Wisdom; yet surely these give the most authoritative knowledge of particulars. But they do not tell us the 'why' of anything – e.g. why fire is hot; they only say that it is hot.

At first he who invented any art whatever that went beyond the common perceptions of man was naturally admired by men, not only because there was something useful in the inventions, but because he was thought wise and superior to the rest. But as more arts were invented, and some were directed to the necessities of life, others to recreation, the inventors of the latter were naturally always regarded as wiser than the inventors of the former, because their branches of knowledge did not aim at utility. Hence when all such inventions were already established, the sciences which do not aim at giving pleasure or at the necessities of life were discovered, and first in the places where men first began to have leisure. This is why the mathematical arts were founded in Egypt; for there the priestly caste was allowed to be at leisure.

We have said in the Ethics what the difference is between art and science and the other kindred faculties; but the point of our present discussion is this, that all men suppose what is called Wisdom to deal with the first causes and the principles of things; so that, as has been said before, the man of experience is thought to be wiser than the possessors of any sense-

perception whatever, the artist wiser than the men of experience, the masterworker than the mechanic, and the theoretical kinds of knowledge to be more of the nature of Wisdom than the productive. Clearly then Wisdom is knowledge about certain principles and causes.

2

Since we are seeking this knowledge, we must inquire of what kind are the causes and the principles, the knowledge of which is Wisdom. If one were to take the notions we have about the wise man, this might perhaps make the answer more evident. We suppose first, then, that the wise man knows all things, as far as possible, although he has not knowledge of each of them in detail; secondly, that he who can learn things that are difficult, and not easy for man to know, is wise (sense-perception is common to all, and therefore easy and no mark of Wisdom); again, that he who is more exact and more capable of teaching the causes is wiser, in every branch of knowledge; and that of the sciences, also, that which is desirable on its own account and for the sake of knowing it is more of the nature of Wisdom than that which is desirable on account of its results, and the superior science is more of the nature of Wisdom than the ancillary; for the wise man must not be ordered but must order, and he must not obey another, but the less wise must obey him.

Such and so many are the notions, then, which we have about Wisdom and the wise. Now of these characteristics that of knowing all things must belong to him who has in the highest degree universal knowledge; for he knows in a sense all the instances that fall under the universal. And these things, the

most universal, are on the whole the hardest for men to know; for they are farthest from the senses. And the most exact of the sciences are those which deal most with first principles; for those which involve fewer principles are more exact than those which involve additional principles, e.g. arithmetic than geometry. But the science which investigates causes is also instructive, in a higher degree, for the people who instruct us are those who tell the causes of each thing. And understanding and knowledge pursued for their own sake are found most in the knowledge of that which is most knowable (for he who chooses to know for the sake of knowing will choose most readily that which is most truly knowledge, and such is the knowledge of that which is most knowable); and the first principles and the causes are most knowable; for by reason of these, and from these, all other things come to be known, and not these by means of the things subordinate to them. And the science which knows to what end each thing must be done is the most authoritative of the sciences, and more authoritative than any ancillary science; and this end is the good of that thing, and in general the supreme good in the whole of nature. Judged by all the tests we have mentioned, then, the name in question falls to the same science; this must be a science that investigates the first principles and causes; for the good, i.e. the end, is one of the causes.

That it is not a science of production is clear even from the history of the earliest philosophers. For it is owing to their wonder that men both now begin and at first began to philosophize; they wondered originally at the obvious difficulties, then advanced little by little and stated difficulties about the greater matters, e.g. about the phenomena of the moon and those of the sun and of the stars, and about the genesis of the universe. And a man who is puzzled and wonders thinks himself ignorant (whence even the lover of myth is in a sense a lover of Wisdom, for the myth is composed of wonders);

therefore since they philosophized order to escape from ignorance, evidently they were pursuing science in order to know, and not for any utilitarian end. And this is confirmed by the facts; for it was when almost all the necessities of life and the things that make for comfort and recreation had been secured, that such knowledge began to be sought. Evidently then we do not seek it for the sake of any other advantage; but as the man is free, we say, who exists for his own sake and not for another's, so we pursue this as the only free science, for it alone exists for its own sake.

Hence also the possession of it might be justly regarded as beyond human power; for in many ways human nature is in bondage, so that according to Simonides 'God alone can have this privilege', and it is unfitting that man should not be content to seek the knowledge that is suited to him. If, then, there is something in what the poets say, and jealousy is natural to the divine power, it would probably occur in this case above all, and all who excelled in this knowledge would be unfortunate. But the divine power cannot be jealous (nay, according to the proverb, 'bards tell a lie'), nor should any other science be thought more honourable than one of this sort. For the most divine science is also most honourable; and this science alone must be, in two ways, most divine. For the science which it would be most meet for God to have is a divine science, and so is any science that deals with divine objects; and this science alone has both these qualities; for (1) God is thought to be among the causes of all things and to be a first principle, and (2) such a science either God alone can have, or God above all others. All the sciences, indeed, are more necessary than this, but none is better.

Yet the acquisition of it must in a sense end in something which is the opposite of our original inquiries. For all men begin, as we said, by wondering that things are as they are, as they do

about self-moving marionettes, or about the solstices or the incommensurability of the diagonal of a square with the side; for it seems wonderful to all who have not yet seen the reason, that there is a thing which cannot be measured even by the smallest unit. But we must end in the contrary and, according to the proverb, the better state, as is the case in these instances too when men learn the cause; for there is nothing which would surprise a geometer so much as if the diagonal turned out to be commensurable.

We have stated, then, what is the nature of the science we are searching for, and what is the mark which our search and our whole investigation must reach.

3

Evidently we have to acquire knowledge of the original causes (for we say we know each thing only when we think we recognize its first cause), and causes are spoken of in four senses. In one of these we mean the substance, i.e. the essence (for the 'why' is reducible finally to the definition, and the ultimate 'why' is a cause and principle); in another the matter or substratum, in a third the source of the change, and in a fourth the cause opposed to this, the purpose and the good (for this is the end of all generation and change). We have studied these causes sufficiently in our work on nature, but yet let us call to our aid those who have attacked the investigation of being and philosophized about reality before us. For obviously they too speak of certain principles and causes; to go over their views, then, will be of profit to the present inquiry, for we shall either find another kind of cause, or be more convinced of the correctness of those which we now maintain.

Of the first philosophers, then, most thought the principles which were of the nature of matter were the only principles of all things. That of which all things that are consist, the first from which they come to be, the last into which they are resolved (the substance remaining, but changing in its modifications), this they say is the element and this the principle of things, and therefore they think nothing is either generated or destroyed, since this sort of entity is always conserved, as we say Socrates neither comes to be absolutely when he comes to be beautiful or musical, nor ceases to be when loses these characteristics, because the substratum, Socrates himself remains. just so they say nothing else comes to be or ceases to be; for there must be some entity – either one or more than one – from which all other things come to be, it being conserved.

Yet they do not all agree as to the number and the nature of these principles. Thales, the founder of this type of philosophy, says the principle is water (for which reason he declared that the earth rests on water), getting the notion perhaps from seeing that the nutriment of all things is moist, and that heat itself is generated from the moist and kept alive by it (and that from which they come to be is a principle of all things). He got his notion from this fact, and from the fact that the seeds of all things have a moist nature, and that water is the origin of the nature of moist things.

Some think that even the ancients who lived long before the present generation, and first framed accounts of the gods, had a similar view of nature; for they made Ocean and Tethys the parents of creation, and described the oath of the gods as being by water, to which they give the name of Styx; for what is oldest is most honourable, and the most honourable thing is that by which one swears. It may perhaps be uncertain whether this opinion about nature is primitive and ancient, but Thales at any

rate is said to have declared himself thus about the first cause. Hippo no one would think fit to include among these thinkers, because of the paltriness of his thought.

Anaximenes and Diogenes make air prior to water, and the most primary of the simple bodies, while Hippasus of Metapontium and Heraclitus of Ephesus say this of fire, and Empedocles says it of the four elements (adding a fourth-earth to those which have been named); for these, he says, always remain and do not come to be, except that they come to be more or fewer, being aggregated into one and segregated out of one.

Anaxagoras of Clazomenae, who, though older than Empedocles, was later in his philosophical activity, says the principles are infinite in number; for he says almost all the things that are made of parts like themselves, in the manner of water or fire, are generated and destroyed in this way, only by aggregation and segregation, and are not in any other sense generated or destroyed, but remain eternally.

From these facts one might think that the only cause is the so-called material cause; but as men thus advanced, the very facts opened the way for them and joined in forcing them to investigate the subject. However true it may be that all generation and destruction proceed from some one or (for that matter) from more elements, why does this happen and what is the cause? For at least the substratum itself does not make itself change; e.g. neither the wood nor the bronze causes the change of either of them, nor does the wood manufacture a bed and the bronze a statue, but something else is the cause of the change. And to seek this is to seek the second cause, as we should say, – that from which comes the beginning of the movement. Now those who at the very beginning set themselves to this kind of inquiry, and said the substratum was

one, were not at all dissatisfied with themselves; but some at least of those who maintain it to be one – as though defeated by this search for the second cause – say the one and nature as a whole is unchangeable not only in respect of generation and destruction (for this is a primitive belief, and all agreed in it), but also of all other change; and this view is peculiar to them. Of those who said the universe was one, then none succeeded in discovering a cause of this sort, except perhaps Parmenides, and he only inasmuch as he supposes that there is not only one but also in some sense two causes. But for those who make more elements it is more possible to state the second cause, e.g. for those who make hot and cold, or fire and earth, the elements; for they treat fire as having a nature which fits it to move things, and water and earth and such things they treat in the contrary way.

When these men and the principles of this kind had had their day, as the latter were found inadequate to generate the nature of things men were again forced by the truth itself, as we said, to inquire into the next kind of cause. For it is not likely either that fire or earth or any such element should be the reason why things manifest goodness and, beauty both in their being and in their coming to be, or that those thinkers should have supposed it was; nor again could it be right to entrust so great a matter to spontaneity and chance. When one man said, then, that reason was present – as in animals, so throughout nature – as the cause of order and of all arrangement, he seemed like a sober man in contrast with the random talk of his predecessors. We know that Anaxagoras certainly adopted these views, but Hermotimus of Clazomenae is credited with expressing them earlier. Those who thought thus stated that there is a principle of things which is at the same time the cause of beauty, and that sort of cause from which things acquire movement.

4

One might suspect that Hesiod was the first to look for such a thing – or some one else who put love or desire among existing things as a principle, as Parmenides, too, does; for he, in constructing the genesis of the universe, says: –

Love first of all the Gods she planned.

And Hesiod says: –

First of all things was chaos made, and then

Broad-breasted earth...

And love, mid all the gods pre-eminent,

which implies that among existing things there must be from the first a cause which will move things and bring them together. How these thinkers should be arranged with regard to priority of discovery let us be allowed to decide later; but since the contraries of the various forms of good were also perceived to be present in nature – not only order and the beautiful, but also disorder and the ugly, and bad things in greater number than good, and ignoble things than beautiful – therefore another thinker introduced friendship and strife, each of the two the cause of one of these two sets of qualities. For if we were to follow out the view of Empedocles, and interpret it according to its meaning and not to its lisping expression, we should find that friendship is the cause of good things, and strife of bad. Therefore, if we said that Empedocles in a sense both mentions, and is the first to mention, the bad and the good as principles, we should perhaps be right, since the cause of all goods is the good itself.

These thinkers, as we say, evidently grasped, and to this extent, two of the causes which we distinguished in our work on nature – the matter and the source of the movement – vaguely, however, and with no clearness, but as untrained men behave in fights; for they go round their opponents and often strike fine blows, but they do not fight on scientific principles, and so too these thinkers do not seem to know what they say; for it is evident that, as a rule, they make no use of their causes except to a small extent. For Anaxagoras uses reason as a deus ex machina for the making of the world, and when he is at a loss to tell from what cause something necessarily is, then he drags reason in, but in all other cases ascribes events to anything rather than to reason. And Empedocles, though he uses the causes to a greater extent than this, neither does so sufficiently nor attains consistency in their use. At least, in many cases he makes love segregate things, and strife aggregate them. For whenever the universe is dissolved into its elements by strife, fire is aggregated into one, and so is each of the other elements; but whenever again under the influence of love they come together into one, the parts must again be segregated out of each element.

Empedocles, then, in contrast with his precessors, was the first to introduce the dividing of this cause, not positing one source of movement, but different and contrary sources. Again, he was the first to speak of four material elements; yet he does not use four, but treats them as two only; he treats fire by itself, and its opposite – earth, air, and water – as one kind of thing. We may learn this by study of his verses.

This philosopher then, as we say, has spoken of the principles in this way, and made them of this number. Leucippus and his associate Democritus say that the full and the empty are the elements, calling the one being and the other non-being – the full and solid being being, the empty non-being (whence they

say being no more is than non-being, because the solid no more is than the empty); and they make these the material causes of things. And as those who make the underlying substance one generate all other things by its modifications, supposing the rare and the dense to be the sources of the modifications, in the same way these philosophers say the differences in the elements are the causes of all other qualities. These differences, they say, are three-shape and order and position. For they say the real is differentiated only by 'rhythm and 'inter-contact' and 'turning'; and of these rhythm is shape, inter-contact is order, and turning is position; for A differs from N in shape, AN from NA in order, M from W in position. The question of movement – whence or how it is to belong to things – these thinkers, like the others, lazily neglected.

Regarding the two causes, then, as we say, the inquiry seems to have been pushed thus far by the early philosophers.

5

Contemporaneously with these philosophers and before them, the so-called Pythagoreans, who were the first to take up mathematics, not only advanced this study, but also having been brought up in it they thought its principles were the principles of all things. Since of these principles numbers are by nature the first, and in numbers they seemed to see many resemblances to the things that exist and come into being – more than in fire and earth and water (such and such a modification of numbers being justice, another being soul and reason, another being opportunity – and similarly almost all other things being numerically expressible); since, again, they saw that the modifications and the ratios of the musical scales

were expressible in numbers; – since, then, all other things seemed in their whole nature to be modelled on numbers, and numbers seemed to be the first things in the whole of nature, they supposed the elements of numbers to be the elements of all things, and the whole heaven to be a musical scale and a number. And all the properties of numbers and scales which they could show to agree with the attributes and parts and the whole arrangement of the heavens, they collected and fitted into their scheme; and if there was a gap anywhere, they readily made additions so as to make their whole theory coherent. E.g. as the number 10 is thought to be perfect and to comprise the whole nature of numbers, they say that the bodies which move through the heavens are ten, but as the visible bodies are only nine, to meet this they invent a tenth – the 'counter-earth'. We have discussed these matters more exactly elsewhere.

But the object of our review is that we may learn from these philosophers also what they suppose to be the principles and how these fall under the causes we have named. Evidently, then, these thinkers also consider that number is the principle both as matter for things and as forming both their modifications and their permanent states, and hold that the elements of number are the even and the odd, and that of these the latter is limited, and the former unlimited; and that the One proceeds from both of these (for it is both even and odd), and number from the One; and that the whole heaven, as has been said, is numbers.

Other members of this same school say there are ten principles, which they arrange in two columns of cognates – limit and unlimited, odd and even, one and plurality, right and left, male and female, resting and moving, straight and curved, light and darkness, good and bad, square and oblong. In this way Alcmaeon of Croton seems also to have conceived the matter, and either he got this view from them or they got it from him;

for he expressed himself similarly to them. For he says most human affairs go in pairs, meaning not definite contrarieties such as the Pythagoreans speak of, but any chance contrarieties, e.g. white and black, sweet and bitter, good and bad, great and small. He threw out indefinite suggestions about the other contrarieties, but the Pythagoreans declared both how many and which their contraricties are.

From both these schools, then, we can learn this much, that the contraries are the principles of things; and how many these principles are and which they are, we can learn from one of the two schools. But how these principles can be brought together under the causes we have named has not been clearly and articulately stated by them; they seem, however, to range the elements under the head of matter; for out of these as immanent parts they say substance is composed and moulded.

From these facts we may sufficiently perceive the meaning of the ancients who said the elements of nature were more than one; but there are some who spoke of the universe as if it were one entity, though they were not all alike either in the excellence of their statement or in its conformity to the facts of nature. The discussion of them is in no way appropriate to our present investigation of causes, for. they do not, like some of the natural philosophers, assume being to be one and yet generate it out of the one as out of matter, but they speak in another way; those others add change, since they generate the universe, but these thinkers say the universe is unchangeable. Yet this much is germane to the present inquiry: Parmenides seems to fasten on that which is one in definition, Melissus on that which is one in matter, for which reason the former says that it is limited, the latter that it is unlimited; while Xenophanes, the first of these partisans of the One (for Parmenides is said to have been his pupil), gave no clear statement, nor does he seem to have grasped the nature of either of these causes, but with reference

to the whole material universe he says the One is God. Now these thinkers, as we said, must be neglected for the purposes of the present inquiry – two of them entirely, as being a little too naive, viz. Xenophanes and Melissus; but Parmenides seems in places to speak with more insight. For, claiming that, besides the existent, nothing non-existent exists, he thinks that of necessity one thing exists, viz. the existent and nothing else (on this we have spoken more clearly in our work on nature), but being forced to follow the observed facts, and supposing the existence of that which is one in definition, but more than one according to our sensations, he now posits two causes and two principles, calling them hot and cold, i.e. fire and earth; and of these he ranges the hot with the existent, and the other with the non-existent.

From what has been said, then, and from the wise men who have now sat in council with us, we have got thus much – on the one hand from the earliest philosophers, who regard the first principle as corporeal (for water and fire and such things are bodies), and of whom some suppose that there is one corporeal principle, others that there are more than one, but both put these under the head of matter; and on the other hand from some who posit both this cause and besides this the source of movement, which we have got from some as single and from others as twofold.

Down to the Italian school, then, and apart from it, philosophers have treated these subjects rather obscurely, except that, as we said, they have in fact used two kinds of cause, and one of these – the source of movement – some treat as one and others as two. But the Pythagoreans have said in the same way that there are two principles, but added this much, which is peculiar to them, that they thought that finitude and infinity were not attributes of certain other things, e.g. of fire or earth or anything else of this kind, but that infinity itself and unity itself were the

substance of the things of which they are predicated. This is why number was the substance of all things. On this subject, then, they expressed themselves thus; and regarding the question of essence they began to make statements and definitions, but treated the matter too simply. For they both defined superficially and thought that the first subject of which a given definition was predicable was the substance of the thing defined, as if one supposed that 'double' and '2' were the same, because 2 is the first thing of which 'double' is predicable. But surely to be double and to be 2 are not the same; if they are, one thing will be many – a consequence which they actually drew. From the earlier philosophers, then, and from their successors we can learn thus much.

6

After the systems we have named came the philosophy of Plato, which in most respects followed these thinkers, but had pecullarities that distinguished it from the philosophy of the Italians. For, having in his youth first become familiar with Cratylus and with the Heraclitean doctrines (that all sensible things are ever in a state of flux and there is no knowledge about them), these views he held even in later years. Socrates, however, was busying himself about ethical matters and neglecting the world of nature as a whole but seeking the universal in these ethical matters, and fixed thought for the first time on definitions; Plato accepted his teaching, but held that the problem applied not to sensible things but to entities of another kind – for this reason, that the common definition could not be a definition of any sensible thing, as they were always changing. Things of this other sort, then, he called Ideas, and sensible things, he said, were all named after these, and in

virtue of a relation to these; for the many existed by participation in the Ideas that have the same name as they. Only the name 'participation' was new; for the Pythagoreans say that things exist by 'imitation' of numbers, and Plato says they exist by participation, changing the name. But what the participation or the imitation of the Forms could be they left an open question.

Further, besides sensible things and Forms he says there are the objects of mathematics, which occupy an intermediate position, differing from sensible things in being eternal and unchangeable, from Forms in that there are many alike, while the Form itself is in each case unique.

Since the Forms were the causes of all other things, he thought their elements were the elements of all things. As matter, the great and the small were principles; as essential reality, the One; for from the great and the small, by participation in the One, come the Numbers.

But he agreed with the Pythagoreans in saying that the One is substance and not a predicate of something else; and in saying that the Numbers are the causes of the reality of other things he agreed with them; but positing a dyad and constructing the infinite out of great and small, instead of treating the infinite as one, is peculiar to him; and so is his view that the Numbers exist apart from sensible things, while they say that the things themselves are Numbers, and do not place the objects of mathematics between Forms and sensible things. His divergence from the Pythagoreans in making the One and the Numbers separate from things, and his introduction of the Forms, were due to his inquiries in the region of definitions (for the earlier thinkers had no tincture of dialectic), and his making the other entity besides the One a dyad was due to the belief that the numbers, except those which were prime, could be

neatly produced out of the dyad as out of some plastic material. Yet what happens is the contrary; the theory is not a reasonable one. For they make many things out of the matter, and the form generates only once, but what we observe is that one table is made from one matter, while the man who applies the form, though he is one, makes many tables. And the relation of the male to the female is similar; for the latter is impregnated by one copulation, but the male impregnates many females; yet these are analogues of those first principles.

Plato, then, declared himself thus on the points in question; it is evident from what has been said that he has used only two causes, that of the essence and the material cause (for the Forms are the causes of the essence of all other things, and the One is the cause of the essence of the Forms); and it is evident what the underlying matter is, of which the Forms are predicated in the case of sensible things, and the One in the case of Forms, viz. that this is a dyad, the great and the small. Further, he has assigned the cause of good and that of evil to the elements, one to each of the two, as we say some of his predecessors sought to do, e.g. Empedocles and Anaxagoras.

7

Our review of those who have spoken about first principles and reality and of the way in which they have spoken, has been concise and summary; but yet we have learnt this much from them, that of those who speak about 'principle' and 'cause' no one has mentioned any principle except those which have been distinguished in our work on nature, but all evidently have some inkling of them, though only vaguely. For some speak of the first principle as matter, whether they suppose one or more

first principles, and whether they suppose this to be a body or to be incorporeal; e.g. Plato spoke of the great and the small, the Italians of the infinite, Empedocles of fire, earth, water, and air, Anaxagoras of the infinity of things composed of similar parts. These, then, have all had a notion of this kind of cause, and so have all who speak of air or fire or water, or something denser than fire and rarer than air; for some have said the prime element is of this kind.

These thinkers grasped this cause only; but certain others have mentioned the source of movement, e.g. those who make friendship and strife, or reason, or love, a principle.

The essence, i.e. the substantial reality, no one has expressed distinctly. It is hinted at chiefly by those who believe in the Forms; for they do not suppose either that the Forms are the matter of sensible things, and the One the matter of the Forms, or that they are the source of movement (for they say these are causes rather of immobility and of being at rest), but they furnish the Forms as the essence of every other thing, and the One as the essence of the Forms.

That for whose sake actions and changes and movements take place, they assert to be a cause in a way, but not in this way, i.e. not in the way in which it is its nature to be a cause. For those who speak of reason or friendship class these causes as goods; they do not speak, however, as if anything that exists either existed or came into being for the sake of these, but as if movements started from these. In the same way those who say the One or the existent is the good, say that it is the cause of substance, but not that substance either is or comes to be for the sake of this. Therefore it turns out that in a sense they both say and do not say the good is a cause; for they do not call it a cause qua good but only incidentally.

All these thinkers then, as they cannot pitch on another cause, seem to testify that we have determined rightly both how many and of what sort the causes are. Besides this it is plain that when the causes are being looked for, either all four must be sought thus or they must be sought in one of these four ways. Let us next discuss the possible difficulties with regard to the way in which each of these thinkers has spoken, and with regard to his situation relatively to the first principles.

8

Those, then, who say the universe is one and posit one kind of thing as matter, and as corporeal matter which has spatial magnitude, evidently go astray in many ways. For they posit the elements of bodies only, not of incorporeal things, though there are also incorporeal things. And in trying to state the causes of generation and destruction, and in giving a physical account of all things, they do away with the cause of movement. Further, they err in not positing the substance, i.e. the essence, as the cause of anything, and besides this in lightly calling any of the simple bodies except earth the first principle, without inquiring how they are produced out of one anothers – I mean fire, water, earth, and air. For some things are produced out of each other by combination, others by separation, and this makes the greatest difference to their priority and posteriority. For (1) in a way the property of being most elementary of all would seem to belong to the first thing from which they are produced by combination, and this property would belong to the most fine-grained and subtle of bodies. For this reason those who make fire the principle would be most in agreement with this argument. But each of the other thinkers agrees that the element of corporeal things is of this sort. At least none of those

who named one element claimed that earth was the element, evidently because of the coarseness of its grain. (Of the other three elements each has found some judge on its side; for some maintain that fire, others that water, others that air is the element. Yet why, after all, do they not name earth also, as most men do? For people say all things are earth Hesiod says earth was produced first of corporeal things; so primitive and popular has the opinion been.) According to this argument, then, no one would be right who either says the first principle is any of the elements other than fire, or supposes it to be denser than air but rarer than water. But (2) if that which is later in generation is prior in nature, and that which is concocted and compounded is later in generation, the contrary of what we have been saying must be true, – water must be prior to air, and earth to water.

So much, then, for those who posit one cause such as we mentioned; but the same is true if one supposes more of these, as Empedocles says matter of things is four bodies. For he too is confronted by consequences some of which are the same as have been mentioned, while others are peculiar to him. For we see these bodies produced from one another, which implies that the same body does not always remain fire or earth (we have spoken about this in our works on nature); and regarding the cause of movement and the question whether we must posit one or two, he must be thought to have spoken neither correctly nor altogether plausibly. And in general, change of quality is necessarily done away with for those who speak thus, for on their view cold will not come from hot nor hot from cold. For if it did there would be something that accepted the contraries themselves, and there would be some one entity that became fire and water, which Empedocles denies.

As regards Anaxagoras, if one were to suppose that he said there were two elements, the supposition would accord thoroughly with an argument which Anaxagoras himself did

not state articulately, but which he must have accepted if any one had led him on to it. True, to say that in the beginning all things were mixed is absurd both on other grounds and because it follows that they must have existed before in an unmixed form, and because nature does not allow any chance thing to be mixed with any chance thing, and also because on this view modifications and accidents could be separated from substances (for the same things which are mixed can be separated); yet if one were to follow him up, piecing together what he means, he would perhaps be seen to be somewhat modern in his views. For when nothing was separated out, evidently nothing could be truly asserted of the substance that then existed. I mean, e.g. that it was neither white nor black, nor grey nor any other colour, but of necessity colourless; for if it had been coloured, it would have had one of these colours. And similarly, by this same argument, it was flavourless, nor had it any similar attribute; for it could not be either of any quality or of any size, nor could it be any definite kind of thing. For if it were, one of the particular forms would have belonged to it, and this is impossible, since all were mixed together; for the particular form would necessarily have been already separated out, but he all were mixed except reason, and this alone was unmixed and pure. From this it follows, then, that he must say the principles are the One (for this is simple and unmixed) and the Other, which is of such a nature as we suppose the indefinite to be before it is defined and partakes of some form. Therefore, while expressing himself neither rightly nor clearly, he means something like what the later thinkers say and what is now more clearly seen to be the case.

But these thinkers are, after all, at home only in arguments about generation and destruction and movement; for it is practically only of this sort of substance that they seek the principles and the causes. But those who extend their vision to all things that exist, and of existing things suppose some to be

perceptible and others not perceptible, evidently study both classes, which is all the more reason why one should devote some time to seeing what is good in their views and what bad from the standpoint of the inquiry we have now before us.

The 'Pythagoreans' treat of principles and elements stranger than those of the physical philosophers (the reason is that they got the principles from non-sensible things, for the objects of mathematics, except those of astronomy, are of the class of things without movement); yet their discussions and investigations are all about nature; for they generate the heavens, and with regard to their parts and attributes and functions they observe the phenomena, and use up the principles and the causes in explaining these, which implies that they agree with the others, the physical philosophers, that the real is just all that which is perceptible and contained by the so-called 'heavens'. But the causes and the principles which they mention are, as we said, sufficient to act as steps even up to the higher realms of reality, and are more suited to these than to theories about nature. They do not tell us at all, however, how there can be movement if limit and unlimited and odd and even are the only things assumed, or how without movement and change there can be generation and destruction, or the bodies that move through the heavens can do what they do.

Further, if one either granted them that spatial magnitude consists of these elements, or this were proved, still how would some bodies be light and others have weight? To judge from what they assume and maintain they are speaking no more of mathematical bodies than of perceptible; hence they have said nothing whatever about fire or earth or the other bodies of this sort, I suppose because they have nothing to say which applies peculiarly to perceptible things.

Further, how are we to combine the beliefs that the attributes of number, and number itself, are causes of what exists and happens in the heavens both from the beginning and now, and that there is no other number than this number out of which the world is composed? When in one particular region they place opinion and opportunity, and, a little above or below, injustice and decision or mixture, and allege, as proof, that each of these is a number, and that there happens to be already in this place a plurality of the extended bodies composed of numbers, because these attributes of number attach to the various places, – this being so, is this number, which we must suppose each of these abstractions to be, the same number which is exhibited in the material universe, or is it another than this? Plato says it is different; yet even he thinks that both these bodies and their causes are numbers, but that the intelligible numbers are causes, while the others are sensible.

9

Let us leave the Pythagoreans for the present; for it is enough to have touched on them as much as we have done. But as for those who posit the Ideas as causes, firstly, in seeking to grasp the causes of the things around us, they introduced others equal in number to these, as if a man who wanted to count things thought he would not be able to do it while they were few, but tried to count them when he had added to their number. For the Forms are practically equal to – or not fewer than – the things, in trying to explain which these thinkers proceeded from them to the Forms. For to each thing there answers an entity which has the same name and exists apart from the substances, and so also in the case of all other groups

there is a one over many, whether the many are in this world or are eternal.

Further, of the ways in which we prove that the Forms exist, none is convincing; for from some no inference necessarily follows, and from some arise Forms even of things of which we think there are no Forms. For according to the arguments from the existence of the sciences there will be Forms of all things of which there are sciences and according to the 'one over many' argument there will be Forms even of negations, and according to the argument that there is an object for thought even when the thing has perished, there will be Forms of perishable things; for we have an image of these. Further, of the more accurate arguments, some lead to Ideas of relations, of which we say there is no independent class, and others introduce the 'third man'.

And in general the arguments for the Forms destroy the things for whose existence we are more zealous than for the existence of the Ideas; for it follows that not the dyad but number is first, i.e. that the relative is prior to the absolute, – besides all the other points on which certain people by following out the opinions held about the Ideas have come into conflict with the principles of the theory.

Further, according to the assumption on which our belief in the Ideas rests, there will be Forms not only of substances but also of many other things (for the concept is single not only in the case of substances but also in the other cases, and there are sciences not only of substance but also of other things, and a thousand other such difficulties confront them). But according to the necessities of the case and the opinions held about the Forms, if Forms can be shared in there must be Ideas of substances only. For they are not shared in incidentally, but a thing must share in its Form as in something not predicated of

a subject (by ‘being shared in incidentally’ I mean that e.g. if a thing shares in ‘double itself’, it shares also in ‘eternal’, but incidentally; for ‘eternal’ happens to be predicable of the ‘double’). Therefore the Forms will be substance; but the same terms indicate substance in this and in the ideal world (or what will be the meaning of saying that there is something apart from the particulars – the one over many?). And if the Ideas and the particulars that share in them have the same form, there will be something common to these; for why should ‘2’ be one and the same in the perishable 2’s or in those which are many but eternal, and not the same in the ‘2’ itself’ as in the particular 2? But if they have not the same form, they must have only the name in common, and it is as if one were to call both Callias and a wooden image a ‘man’, without observing any community between them.

Above all one might discuss the question what on earth the Forms contribute to sensible things, either to those that are eternal or to those that come into being and cease to be. For they cause neither movement nor any change in them. But again they help in no wise either towards the knowledge of the other things (for they are not even the substance of these, else they would have been in them), or towards their being, if they are not in the particulars which share in them; though if they were, they might be thought to be causes, as white causes whiteness in a white object by entering into its composition. But this argument, which first Anaxagoras and later Eudoxus and certain others used, is very easily upset; for it is not difficult to collect many insuperable objections to such a view.

But, further, all other things cannot come from the Forms in any of the usual senses of ‘from’. And to say that they are patterns and the other things share in them is to use empty words and poetical metaphors. For what is it that works, looking to the Ideas? And anything can either be, or become, like another

without being copied from it, so that whether Socrates or not a man Socrates like might come to be; and evidently this might be so even if Socrates were eternal. And there will be several patterns of the same thing, and therefore several Forms; e.g. 'animal' and 'two-footed' and also 'man himself' will be Forms of man. Again, the Forms are patterns not only sensible things, but of Forms themselves also; i.e. the genus, as genus of various species, will be so; therefore the same thing will be pattern and copy.

Again, it would seem impossible that the substance and that of which it is the substance should exist apart; how, therefore, could the Ideas, being the substances of things, exist apart? In the Phaedo' the case is stated in this way – that the Forms are causes both of being and of becoming; yet when the Forms exist, still the things that share in them do not come into being, unless there is something to originate movement; and many other things come into being (e.g. a house or a ring) of which we say there are no Forms. Clearly, therefore, even the other things can both be and come into being owing to such causes as produce the things just mentioned.

Again, if the Forms are numbers, how can they be causes? Is it because existing things are other numbers, e.g. one number is man, another is Socrates, another Callias? Why then are the one set of numbers causes of the other set? It will not make any difference even if the former are eternal and the latter are not. But if it is because things in this sensible world (e.g. harmony) are ratios of numbers, evidently the things between which they are ratios are some one class of things. If, then, this – the matter – is some definite thing, evidently the numbers themselves too will be ratios of something to something else. E.g. if Callias is a numerical ratio between fire and earth and water and air, his Idea also will be a number of certain other underlying things; and man himself, whether it is a number in a sense or not, will

still be a numerical ratio of certain things and not a number proper, nor will it be a of number merely because it is a numerical ratio.

Again, from many numbers one number is produced, but how can one Form come from many Forms? And if the number comes not from the many numbers themselves but from the units in them, e.g. in 10,000, how is it with the units? If they are specifically alike, numerous absurdities will follow, and also if they are not alike (neither the units in one number being themselves like one another nor those in other numbers being all like to all); for in what will they differ, as they are without quality? This is not a plausible view, nor is it consistent with our thought on the matter.

Further, they must set up a second kind of number (with which arithmetic deals), and all the objects which are called 'intermediate' by some thinkers; and how do these exist or from what principles do they proceed? Or why must they be intermediate between the things in this sensible world and the things-themselves?

Further, the units in must each come from a prior but this is impossible.

Further, why is a number, when taken all together, one?

Again, besides what has been said, if the units are diverse the Platonists should have spoken like those who say there are four, or two, elements; for each of these thinkers gives the name of element not to that which is common, e.g. to body, but to fire and earth, whether there is something common to them, viz. body, or not. But in fact the Platonists speak as if the One were homogeneous like fire or water; and if this is so, the numbers will not be substances. Evidently, if there is a One itself and this

is a first principle, 'one' is being used in more than one sense; for otherwise the theory is impossible.

When we wish to reduce substances to their principles, we state that lines come from the short and long (i.e. from a kind of small and great), and the plane from the broad and narrow, and body from the deep and shallow. Yet how then can either the plane contain a line, or the solid a line or a plane? For the broad and narrow is a different class from the deep and shallow. Therefore, just as number is not present in these, because the many and few are different from these, evidently no other of the higher classes will be present in the lower. But again the broad is not a genus which includes the deep, for then the solid would have been a species of plane. Further, from what principle will the presence of the points in the line be derived? Plato even used to object to this class of things as being a geometrical fiction. He gave the name of principle of the line – and this he often posited – to the indivisible lines. Yet these must have a limit; therefore the argument from which the existence of the line follows proves also the existence of the point.

In general, though philosophy seeks the cause of perceptible things, we have given this up (for we say nothing of the cause from which change takes its start), but while we fancy we are stating the substance of perceptible things, we assert the existence of a second class of substances, while our account of the way in which they are the substances of perceptible things is empty talk; for 'sharing', as we said before, means nothing.

Nor have the Forms any connexion with what we see to be the cause in the case of the arts, that for whose sake both all mind and the whole of nature are operative, – with this cause which we assert to be one of the first principles; but mathematics has come to be identical with philosophy for modern thinkers, though they say that it should be studied for the sake of other

things. Further, one might suppose that the substance which according to them underlies as matter is too mathematical, and is a predicate and differentia of the substance, ie. of the matter, rather than matter itself; i.e. the great and the small are like the rare and the dense which the physical philosophers speak of, calling these the primary differentiae of the substratum; for these are a kind of excess and defect. And regarding movement, if the great and the small are to he movement, evidently the Forms will be moved; but if they are not to be movement, whence did movement come? The whole study of nature has been annihilated.

And what is thought to be easy – to show that all things are one – is not done; for what is proved by the method of setting out instances is not that all things are one but that there is a One itself, – if we grant all the assumptions. And not even this follows, if we do not grant that the universal is a genus; and this in some cases it cannot be.

Nor can it be explained either how the lines and planes and solids that come after the numbers exist or can exist, or what significance they have; for these can neither be Forms (for they are not numbers), nor the intermediates (for those are the objects of mathematics), nor the perishable things. This is evidently a distinct fourth class.

In general, if we search for the elements of existing things without distinguishing the many senses in which things are said to exist, we cannot find them, especially if the search for the elements of which things are made is conducted in this manner. For it is surely impossible to discover what 'acting' or 'being acted on', or 'the straight', is made of, but if elements can be discovered at all, it is only the elements of substances; therefore either to seek the elements of all existing things or to think one has them is incorrect.

And how could we learn the elements of all things? Evidently we cannot start by knowing anything before. For as he who is learning geometry, though he may know other things before, knows none of the things with which the science deals and about which he is to learn, so is it in all other cases. Therefore if there is a science of all things, such as some assert to exist, he who is learning this will know nothing before. Yet all learning is by means of premisses which are (either all or some of them) known before, – whether the learning be by demonstration or by definitions; for the elements of the definition must be known before and be familiar; and learning by induction proceeds similarly. But again, if the science were actually innate, it were strange that we are unaware of our possession of the greatest of sciences.

Again, how is one to come to know what all things are made of, and how is this to be made evident? This also affords a difficulty; for there might be a conflict of opinion, as there is about certain syllables; some say za is made out of s and d and a, while others say it is a distinct sound and none of those that are familiar.

Further, how could we know the objects of sense without having the sense in question? Yet we ought to, if the elements of which all things consist, as complex sounds consist of the clements proper to sound, are the same.

10

It is evident, then, even from what we have said before, that all men seem to seek the causes named in the Physics, and that we cannot name any beyond these; but they seek these vaguely; and though in a sense they have all been described before, in a

sense they have not been described at all. For the earliest philosophy is, on all subjects, like one who lisps, since it is young and in its beginnings. For even Empedocles says bone exists by virtue of the ratio in it. Now this is the essence and the substance of the thing. But it is similarly necessary that flesh and each of the other tissues should be the ratio of its elements, or that not one of them should; for it is on account of this that both flesh and bone and everything else will exist, and not on account of the matter, which he names, – fire and earth and water and air. But while he would necessarily have agreed if another had said this, he has not said it clearly.

On these questions our views have been expressed before; but let us return to enumerate the difficulties that might be raised on these same points; for perhaps we may get from them some help towards our later difficulties.

Book α

1

The investigation of the truth is in one way hard, in another easy. An indication of this is found in the fact that no one is able to attain the truth adequately, while, on the other hand, we do not collectively fail, but every one says something true about the nature of things, and while individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed. Therefore, since the truth seems to be like

the proverbial door, which no one can fail to hit, in this respect it must be easy, but the fact that we can have a whole truth and not the particular part we aim at shows the difficulty of it.

Perhaps, too, as difficulties are of two kinds, the cause of the present difficulty is not in the facts but in us. For as the eyes of bats are to the blaze of day, so is the reason in our soul to the things which are by nature most evident of all.

It is just that we should be grateful, not only to those with whose views we may agree, but also to those who have expressed more superficial views; for these also contributed something, by developing before us the powers of thought. It is true that if there had been no Timotheus we should have been without much of our lyric poetry; but if there had been no Phrynis there would have been no Timotheus. The same holds good of those who have expressed views about the truth; for from some thinkers we have inherited certain opinions, while the others have been responsible for the appearance of the former.

It is right also that philosophy should be called knowledge of the truth. For the end of theoretical knowledge is truth, while that of practical knowledge is action (for even if they consider how things are, practical men do not study the eternal, but what is relative and in the present). Now we do not know a truth without its cause; and a thing has a quality in a higher degree than other things if in virtue of it the similar quality belongs to the other things as well (e.g. fire is the hottest of things; for it is the cause of the heat of all other things); so that that causes derivative truths to be true is most true. Hence the principles of eternal things must be always most true (for they are not merely sometimes true, nor is there any cause of their being, but they themselves are the cause of the being of other things),

so that as each thing is in respect of being, so is it in respect of truth.

2

But evidently there is a first principle, and the causes of things are neither an infinite series nor infinitely various in kind. For neither can one thing proceed from another, as from matter, ad infinitum (e.g. flesh from earth, earth from air, air from fire, and so on without stopping), nor can the sources of movement form an endless series (man for instance being acted on by air, air by the sun, the sun by Strife, and so on without limit). Similarly the final causes cannot go on ad infinitum, – walking being for the sake of health, this for the sake of happiness, happiness for the sake of something else, and so one thing always for the sake of another. And the case of the essence is similar. For in the case of intermediates, which have a last term and a term prior to them, the prior must be the cause of the later terms. For if we had to say which of the three is the cause, we should say the first; surely not the last, for the final term is the cause of none; nor even the intermediate, for it is the cause only of one. (It makes no difference whether there is one intermediate or more, nor whether they are infinite or finite in number.) But of series which are infinite in this way, and of the infinite in general, all the parts down to that now present are alike intermediates; so that if there is no first there is no cause at all.

Nor can there be an infinite process downwards, with a beginning in the upward direction, so that water should proceed from fire, earth from water, and so always some other kind should be produced. For one thing comes from another in two ways – not in the sense in which ‘from’ means ‘after’ (as we say

‘from the Isthmian games come the Olympian’), but either (i) as the man comes from the boy, by the boy’s changing, or (ii) as air comes from water. By ‘as the man comes from the boy’ we mean ‘as that which has come to be from that which is coming to be’ or ‘as that which is finished from that which is being achieved’ (for as becoming is between being and not being, so that which is becoming is always between that which is and that which is not; for the learner is a man of science in the making, and this is what is meant when we say that from a learner a man of science is being made); on the other hand, coming from another thing as water comes from air implies the destruction of the other thing. This is why changes of the former kind are not reversible, and the boy does not come from the man (for it is not that which comes to be something that comes to be as a result of coming to be, but that which exists after the coming to be; for it is thus that the day, too, comes from the morning – in the sense that it comes after the morning; which is the reason why the morning cannot come from the day); but changes of the other kind are reversible. But in both cases it is impossible that the number of terms should be infinite. For terms of the former kind, being intermediates, must have an end, and terms of the latter kind change back into one another, for the destruction of either is the generation of the other.

At the same time it is impossible that the first cause, being eternal, should be destroyed; for since the process of becoming is not infinite in the upward direction, that which is the first thing by whose destruction something came to be must be non-eternal.

Further, the final cause is an end, and that sort of end which is not for the sake of something else, but for whose sake everything else is; so that if there is to be a last term of this sort, the process will not be infinite; but if there is no such term,

there will be no final cause, but those who maintain the infinite series eliminate the Good without knowing it (yet no one would try to do anything if he were not going to come to a limit); nor would there be reason in the world; the reasonable man, at least, always acts for a purpose, and this is a limit; for the end is a limit.

But the essence, also, cannot be reduced to another definition which is fuller in expression. For the original definition is always more of a definition, and not the later one; and in a series in which the first term has not the required character, the next has not it either. Further, those who speak thus destroy science; for it is not possible to have this till one comes to the unanalysable terms. And knowledge becomes impossible; for how can one apprehend things that are infinite in this way? For this is not like the case of the line, to whose divisibility there is no stop, but which we cannot think if we do not make a stop (for which reason one who is tracing the infinitely divisible line cannot be counting the possibilities of section), but the whole line also must be apprehended by something in us that does not move from part to part. – Again, nothing infinite can exist; and if it could, at least the notion of infinity is not infinite.

But if the kinds of causes had been infinite in number, then also knowledge would have been impossible; for we think we know, only when we have ascertained the causes, that but that which is infinite by addition cannot be gone through in a finite time.

3

The effect which lectures produce on a hearer depends on his habits; for we demand the language we are accustomed to, and that which is different from this seems not in keeping but

somewhat unintelligible and foreign because of its unwontedness. For it is the customary that is intelligible. The force of habit is shown by the laws, in which the legendary and childish elements prevail over our knowledge about them, owing to habit. Thus some people do not listen to a speaker unless he speaks mathematically, others unless he gives instances, while others expect him to cite a poet as witness. And some want to have everything done accurately, while others are annoyed by accuracy, either because they cannot follow the connexion of thought or because they regard it as pettifoggery. For accuracy has something of this character, so that as in trade so in argument some people think it mean. Hence one must be already trained to know how to take each sort of argument, since it is absurd to seek at the same time knowledge and the way of attaining knowledge; and it is not easy to get even one of the two.

The minute accuracy of mathematics is not to be demanded in all cases, but only in the case of things which have no matter. Hence method is not that of natural science; for presumably the whole of nature has matter. Hence we must inquire first what nature is: for thus we shall also see what natural science treats of (and whether it belongs to one science or to more to investigate the causes and the principles of things).

Book B

1

We must, with a view to the science which we are seeking, first recount the subjects that should be first discussed. These include both the other opinions that some have held on the first principles, and any point besides these that happens to have been overlooked. For those who wish to get clear of difficulties it is advantageous to discuss the difficulties well; for the subsequent free play of thought implies the solution of the previous difficulties, and it is not possible to untie a knot of which one does not know. But the difficulty of our thinking points to a 'knot' in the object; for in so far as our thought is in difficulties, it is in like case with those who are bound; for in either case it is impossible to go forward. Hence one should have surveyed all the difficulties beforehand, both for the purposes we have stated and because people who inquire without first stating the difficulties are like those who do not know where they have to go; besides, a man does not otherwise know even whether he has at any given time found what he is looking for or not; for the end is not clear to such a man, while to him who has first discussed the difficulties it is clear. Further, he who has heard all the contending arguments, as if they were the parties to a case, must be in a better position for judging.

The first problem concerns the subject which we discussed in our prefatory remarks. It is this – (1) whether the investigation of the causes belongs to one or to more sciences, and (2) whether such a science should survey only the first principles of substance, or also the principles on which all men base their proofs, e.g. whether it is possible at the same time to assert and

deny one and the same thing or not, and all other such questions; and (3) if the science in question deals with substance, whether one science deals with all substances, or more than one, and if more, whether all are akin, or some of them must be called forms of Wisdom and the others something else. And (4) this itself is also one of the things that must be discussed – whether sensible substances alone should be said to exist or others also besides them, and whether these others are of one kind or there are several classes of substances, as is supposed by those who believe both in Forms and in mathematical objects intermediate between these and sensible things. Into these questions, then, as we say, we must inquire, and also (5) whether our investigation is concerned only with substances or also with the essential attributes of substances. Further, with regard to the same and other and like and unlike and contrariety, and with regard to prior and posterior and all other such terms about which the dialecticians try to inquire, starting their investigation from probable premises only, – whose business is it to inquire into all these? Further, we must discuss the essential attributes of these themselves; and we must ask not only what each of these is, but also whether one thing always has one contrary. Again (6), are the principles and elements of things the genera, or the parts present in each thing, into which it is divided; and (7) if they are the genera, are they the genera that are predicated proximately of the individuals, or the highest genera, e.g. is animal or man the first principle and the more independent of the individual instance? And (8) we must inquire and discuss especially whether there is, besides the matter, any thing that is a cause in itself or not, and whether this can exist apart or not, and whether it is one or more in number, and whether there is something apart from the concrete thing (by the concrete thing I mean the matter with something already predicated of it), or there is nothing apart, or there is something in some cases though not in others,

and what sort of cases these are. Again (9) we ask whether the principles are limited in number or in kind, both those in the definitions and those in the substratum; and (10) whether the principles of perishable and of imperishable things are the same or different; and whether they are all imperishable or those of perishable things are perishable. Further (11) there is the question which is hardest of all and most perplexing, whether unity and being, as the Pythagoreans and Plato said, are not attributes of something else but the substance of existing things, or this is not the case, but the substratum is something else, – as Empedocles says, love; as some one else says, fire; while another says water or air. Again (12) we ask whether the principles are universal or like individual things, and (13) whether they exist potentially or actually, and further, whether they are potential or actual in any other sense than in reference to movement; for these questions also would present much difficulty. Further (14), are numbers and lines and figures and points a kind of substance or not, and if they are substances are they separate from sensible things or present in them? With regard to all these matters not only is it hard to get possession of the truth, but it is not easy even to think out the difficulties well.

2

(1) First then with regard to what we mentioned first, does it belong to one or to more sciences to investigate all the kinds of causes? How could it belong to one science to recognize the principles if these are not contrary?

Further, there are many things to which not all the principles pertain. For how can a principle of change or the nature of the

good exist for unchangeable things, since everything that in itself and by its own nature is good is an end, and a cause in the sense that for its sake the other things both come to be and are, and since an end or purpose is the end of some action, and all actions imply change? So in the case of unchangeable things this principle could not exist, nor could there be a good itself. This is why in mathematics nothing is proved by means of this kind of cause, nor is there any demonstration of this kind – 'because it is better, or worse'; indeed no one even mentions anything of the kind. And so for this reason some of the Sophists, e.g. Aristippus, used to ridicule mathematics; for in the arts (he maintained), even in the industrial arts, e.g. in carpentry and cobbling, the reason always given is 'because it is better, or worse,' but the mathematical sciences take no account of goods and evils.

But if there are several sciences of the causes, and a different science for each different principle, which of these sciences should be said to be that which we seek, or which of the people who possess them has the most scientific knowledge of the object in question? The same thing may have all the kinds of causes, e.g. the moving cause of a house is the art or the builder, the final cause is the function it fulfils, the matter is earth and stones, and the form is the definition. To judge from our previous discussion of the question which of the sciences should be called Wisdom, there is reason for applying the name to each of them. For inasmuch as it is most architectonic and authoritative and the other sciences, like slavewomen, may not even contradict it, the science of the end and of the good is of the nature of Wisdom (for the other things are for the sake of the end). But inasmuch as it was described' as dealing with the first causes and that which is in the highest sense object of knowledge, the science of substance must be of the nature of Wisdom. For since men may know the same thing in many ways, we say that he who recognizes what a thing is by its being

so and so knows more fully than he who recognizes it by its not being so and so, and in the former class itself one knows more fully than another, and he knows most fully who knows what a thing is, not he who knows its quantity or quality or what it can by nature do or have done to it. And further in all cases also we think that the knowledge of each even of the things of which demonstration is possible is present only when we know what the thing is, e.g. what squaring a rectangle is, viz. that it is the finding of a mean; and similarly in all other cases. And we know about becomings and actions and about every change when we know the source of the movement; and this is other than and opposed to the end. Therefore it would seem to belong to different sciences to investigate these causes severally.

But (2), taking the starting-points of demonstration as well as the causes, it is a disputable question whether they are the object of one science or of more (by the starting-points of demonstration I mean the common beliefs, on which all men base their proofs); e.g. that everything must be either affirmed or denied, and that a thing cannot at the same time be and not be, and all other such premisses: – the question is whether the same science deals with them as with substance, or a different science, and if it is not one science, which of the two must be identified with that which we now seek. – It is not reasonable that these topics should be the object of one science; for why should it be peculiarly appropriate to geometry or to any other science to understand these matters? If then it belongs to every science alike, and cannot belong to all, it is not peculiar to the science which investigates substances, any more than to any other science, to know about these topics. – And, at the same time, in what way can there be a science of the first principles? For we are aware even now what each of them in fact is (at least even other sciences use them as familiar); but if there is a demonstrative science which deals with them, there will have to be an underlying kind, and some of them must be

demonstrable attributes and others must be axioms (for it is impossible that there should be demonstration about all of them); for the demonstration must start from certain premisses and be about a certain subject and prove certain attributes. Therefore it follows that all attributes that are proved must belong to a single class; for all demonstrative sciences use the axioms.

But if the science of substance and the science which deals with the axioms are different, which of them is by nature more authoritative and prior? The axioms are most universal and are principles of all things. And if it is not the business of the philosopher, to whom else will it belong to inquire what is true and what is untrue about them?

(3) In general, do all substances fall under one science or under more than one? If the latter, to what sort of substance is the present science to be assigned? – On the other hand, it is not reasonable that one science should deal with all. For then there would be one demonstrative science dealing with all attributes. For ever demonstrative science investigates with regard to some subject its essential attributes, starting from the common beliefs. Therefore to investigate the essential attributes of one class of things, starting from one set of beliefs, is the business of one science. For the subject belongs to one science, and the premisses belong to one, whether to the same or to another; so that the attributes do so too, whether they are investigated by these sciences or by one compounded out of them.

(5) Further, does our investigation deal with substances alone or also with their attributes? I mean for instance, if the solid is a substance and so are lines and planes, is it the business of the same science to know these and to know the attributes of each of these classes (the attributes about which the mathematical sciences offer proofs), or of a different science? If of the same,

the science of substance also must be a demonstrative science, but it is thought that there is no demonstration of the essence of things. And if of another, what will be the science that investigates the attributes of substance? This is a very difficult question.

(4) Further, must we say that sensible substances alone exist, or that there are others besides these? And are substances of one kind or are there in fact several kinds of substances, as those say who assert the existence both of the Forms and of the intermediates, with which they say the mathematical sciences deal? – The sense in which we say the Forms are both causes and self-dependent substances has been explained in our first remarks about them; while the theory presents difficulties in many ways, the most paradoxical thing of all is the statement that there are certain things besides those in the material universe, and that these are the same as sensible things except that they are eternal while the latter are perishable. For they say there is a man-himself and a horse-itself and health-itself, with no further qualification, – a procedure like that of the people who said there are gods, but in human form. For they were positing nothing but eternal men, nor are the Platonists making the Forms anything other than eternal sensible things.

Further, if we are to posit besides the Forms and the sensibles the intermediates between them, we shall have many difficulties. For clearly on the same principle there will be lines besides the lines-themselves and the sensible lines, and so with each of the other classes of things; so that since astronomy is one of these mathematical sciences there will also be a heaven besides the sensible heaven, and a sun and a moon (and so with the other heavenly bodies) besides the sensible. Yet how are we to believe in these things? It is not reasonable even to suppose such a body immovable, but to suppose it moving is quite impossible. – And similarly with the things of which optics and

mathematical harmonics treat; for these also cannot exist apart from the sensible things, for the same reasons. For if there are sensible things and sensations intermediate between Form and individual, evidently there will also be animals intermediate between animals-themselves and the perishable animals. – We might also raise the question, with reference to which kind of existing things we must look for these sciences of intermediates. If geometry is to differ from mensuration only in this, that the latter deals with things that we perceive, and the former with things that are not perceptible, evidently there will also be a science other than medicine, intermediate between medical-science-itself and this individual medical science, and so with each of the other sciences. Yet how is this possible? There would have to be also healthy things besides the perceptible healthy things and the healthy-itself. – And at the same time not even this is true, that mensuration deals with perceptible and perishable magnitudes; for then it would have perished when they perished.

But on the other hand astronomy cannot be dealing with perceptible magnitudes nor with this heaven above us. For neither are perceptible lines such lines as the geometer speaks of (for no perceptible thing is straight or round in the way in which he defines 'straight' and 'round'; for a hoop touches a straight edge not at a point, but as Protagoras used to say it did, in his refutation of the geometers), nor are the movements and spiral orbits in the heavens like those of which astronomy treats, nor have geometrical points the same nature as the actual stars. – Now there are some who say that these so-called intermediates between the Forms and the perceptible things exist, not apart from the perceptible things, however, but in these; the impossible results of this view would take too long to enumerate, but it is enough to consider even such points as the following: – It is not reasonable that this should be so only in the case of these intermediates, but clearly the Forms also

might be in the perceptible things; for both statements are parts of the same theory. Further, it follows from this theory that there are two solids in the same place, and that the intermediates are not immovable, since they are in the moving perceptible things. And in general to what purpose would one suppose them to exist indeed, but to exist in perceptible things? For the same paradoxical results will follow which we have already mentioned; there will be a heaven besides the heaven, only it will be not apart but in the same place; which is still more impossible.

3

(6) Apart from the great difficulty of stating the case truly with regard to these matters, it is very hard to say, with regard to the first principles, whether it is the genera that should be taken as elements and principles, or rather the primary constituents of a thing; e.g. it is the primary parts of which articulate sounds consist that are thought to be elements and principles of articulate sound, not the common genus-articulate sound; and we give the name of 'elements' to those geometrical propositions, the proofs of which are implied in the proofs of the others, either of all or of most. Further, both those who say there are several elements of corporeal things and those who say there is one, say the parts of which bodies are compounded and consist are principles; e.g. Empedocles says fire and water and the rest are the constituent elements of things, but does not describe these as genera of existing things. Besides this, if we want to examine the nature of anything else, we examine the parts of which, e.g. a bed consists and how they are put together, and then we know its nature.

To judge from these arguments, then, the principles of things would not be the genera; but if we know each thing by its definition, and the genera are the principles or starting-points of definitions, the genera must also be the principles of definable things. And if to get the knowledge of the species according to which things are named is to get the knowledge of things, the genera are at least starting-points of the species. And some also of those who say unity or being, or the great and the small, are elements of things, seem to treat them as genera.

But, again, it is not possible to describe the principles in both ways. For the formula of the essence is one; but definition by genera will be different from that which states the constituent parts of a thing.

(7) Besides this, even if the genera are in the highest degree principles, should one regard the first of the genera as principles, or those which are predicated directly of the individuals? This also admits of dispute. For if the universals are always more of the nature of principles, evidently the uppermost of the genera are the principles; for these are predicated of all things. There will, then, be as many principles of things as there are primary genera, so that both being and unity will be principles and substances; for these are most of all predicated of all existing things. But it is not possible that either unity or being should be a single genus of things; for the differentiae of any genus must each of them both have being and be one, but it is not possible for the genus taken apart from its species (any more than for the species of the genus) to be predicated of its proper differentiae; so that if unity or being is a genus, no differentia will either have being or be one. But if unity and being are not genera, neither will they be principles, if the genera are the principles. Again, the intermediate kinds, in whose nature the differentiae are included, will on this theory be genera, down to the indivisible species; but as it is, some are

thought to be genera and others are not thought to be so. Besides this, the differentiae are principles even more than the genera; and if these also are principles, there comes to be practically an infinite number of principles, especially if we suppose the highest genus to be a principle. – But again, if unity is more of the nature of a principle, and the indivisible is one, and everything indivisible is so either in quantity or in species, and that which is so in species is the prior, and genera are divisible into species for man is not the genus of individual men), that which is predicated directly of the individuals will have more unity. – Further, in the case of things in which the distinction of prior and posterior is present, that which is predicable of these things cannot be something apart from them (e.g. if two is the first of numbers, there will not be a Number apart from the kinds of numbers; and similarly there will not be a Figure apart from the kinds of figures; and if the genera of these things do not exist apart from the species, the genera of other things will scarcely do so; for genera of these things are thought to exist if any do). But among the individuals one is not prior and another posterior. Further, where one thing is better and another worse, the better is always prior; so that of these also no genus can exist. From these considerations, then, the species predicated of individuals seem to be principles rather than the genera. But again, it is not easy to say in what sense these are to be taken as principles. For the principle or cause must exist alongside of the things of which it is the principle, and must be capable of existing in separation from them; but for what reason should we suppose any such thing to exist alongside of the individual, except that it is predicated universally and of all? But if this is the reason, the things that are more universal must be supposed to be more of the nature of principles; so that the highest genera would be the principles.

4

(8) There is a difficulty connected with these, the hardest of all and the most necessary to examine, and of this the discussion now awaits us. If, on the one hand, there is nothing apart from individual things, and the individuals are infinite in number, how then is it possible to get knowledge of the infinite individuals? For all things that we come to know, we come to know in so far as they have some unity and identity, and in so far as some attribute belongs to them universally.

But if this is necessary, and there must be something apart from the individuals, it will be necessary that the genera exist apart from the individuals, either the lowest or the highest genera; but we found by discussion just now that this is impossible.

Further, if we admit in the fullest sense that something exists apart from the concrete thing, whenever something is predicated of the matter, must there, if there is something apart, be something apart from each set of individuals, or from some and not from others, or from none? (A) If there is nothing apart from individuals, there will be no object of thought, but all things will be objects of sense, and there will not be knowledge of anything, unless we say that sensation is knowledge. Further, nothing will be eternal or unmovable; for all perceptible things perish and are in movement. But if there is nothing eternal, neither can there be a process of coming to be; for there must be something that comes to be, i.e. from which something comes to be, and the ultimate term in this series cannot have come to be, since the series has a limit and since nothing can come to be out of that which is not. Further, if generation and movement exist there must also be a limit; for no movement is infinite, but every movement has an end, and that which is incapable of completing its coming to be cannot be in process of

coming to be; and that which has completed its coming to be must he as soon as it has come to be. Further, since the matter exists, because it is ungenerated, it is a fortiori reasonable that the substance or essence, that which the matter is at any time coming to be, should exist; for if neither essence nor matter is to be, nothing will be at all, and since this is impossible there must be something besides the concrete thing, viz. the shape or form.

But again (B) if we are to suppose this, it is hard to say in which cases we are to suppose it and in which not. For evidently it is not possible to suppose it in all cases; we could not suppose that there is a house besides the particular houses. – Besides this, will the substance of all the individuals, e.g. of all men, be one? This is paradoxical, for all the things whose substance is one are one. But are the substances many and different? This also is unreasonable. – At the same time, how does the matter become each of the individuals, and how is the concrete thing these two elements?

(9) Again, one might ask the following question also about the first principles. If they are one in kind only, nothing will be numerically one, not even unity-itself and being-itself; and how will knowing exist, if there is not to be something common to a whole set of individuals?

But if there is a common element which is numerically one, and each of the principles is one, and the principles are not as in the case of perceptible things different for different things (e.g. since this particular syllable is the same in kind whenever it occurs, the elements it are also the same in kind; only in kind, for these also, like the syllable, are numerically different in different contexts), – if it is not like this but the principles of things are numerically one, there will be nothing else besides the elements (for there is no difference of meaning between

‘numerically one’ and ‘individual’; for this is just what we mean by the individual – the numerically one, and by the universal we mean that which is predicable of the individuals). Therefore it will be just as if the elements of articulate sound were limited in number; all the language in the world would be confined to the ABC, since there could not be two or more letters of the same kind.

(10) One difficulty which is as great as any has been neglected both by modern philosophers and by their predecessors – whether the principles of perishable and those of imperishable things are the same or different. If they are the same, how are some things perishable and others imperishable, and for what reason? The school of Hesiod and all the theologians thought only of what was plausible to themselves, and had no regard to us. For, asserting the first principles to be gods and born of gods, they say that the beings which did not taste of nectar and ambrosia became mortal; and clearly they are using words which are familiar to themselves, yet what they have said about the very application of these causes is above our comprehension. For if the gods taste of nectar and ambrosia for their pleasure, these are in no wise the causes of their existence; and if they taste them to maintain their existence, how can gods who need food be eternal? – But into the subtleties of the mythologists it is not worth our while to inquire seriously; those, however, who use the language of proof we must cross-examine and ask why, after all, things which consist of the same elements are, some of them, eternal in nature, while others perish. Since these philosophers mention no cause, and it is unreasonable that things should be as they say, evidently the principles or causes of things cannot be the same. Even the man whom one might suppose to speak most consistently – Empedocles, even he has made the same mistake; for he maintains that strife is a principle that causes destruction, but even strife would seem no less to produce

everything, except the One; for all things excepting God proceed from strife. At least he says: –

From which all that was and is and will be hereafter –

Trees, and men and women, took their growth,

And beasts and birds and water-nourished fish,

And long-aged gods.

The implication is evident even apart from these words; for if strife had not been present in things, all things would have been one, according to him; for when they have come together, ‘then strife stood outermost.’ Hence it also follows on his theory that God most blessed is less wise than all others; for he does not know all the elements; for he has in him no strife, and knowledge is of the like by the like. ‘For by earth,’ he says,

We see earth, by water water,

By ether godlike ether, by fire wasting fire,

Love by love, and strife by gloomy strife.

But – and this is the point we started from this at least is evident, that on his theory it follows that strife is as much the cause of existence as of destruction. And similarly love is not specially the cause of existence; for in collecting things into the One it destroys all other things. And at the same time Empedocles mentions no cause of the change itself, except that things are so by nature.

But when strife at last waxed great in the limbs of the Sphere,

And sprang to assert its rights as the time was fulfilled

Which is fixed for them in turn by a mighty oath.

This implies that change was necessary; but he shows no cause of the necessity. But yet so far at least he alone speaks consistently; for he does not make some things perishable and others imperishable, but makes all perishable except the elements. The difficulty we are speaking of now is, why some things are perishable and others are not, if they consist of the same principles.

Let this suffice as proof of the fact that the principles cannot be the same. But if there are different principles, one difficulty is whether these also will be imperishable or perishable. For if they are perishable, evidently these also must consist of certain elements (for all things that perish, perish by being resolved into the elements of which they consist); so that it follows that prior to the principles there are other principles. But this is impossible, whether the process has a limit or proceeds to infinity. Further, how will perishable things exist, if their principles are to be annulled? But if the principles are imperishable, why will things composed of some imperishable principles be perishable, while those composed of the others are imperishable? This is not probable, but is either impossible or needs much proof. Further, no one has even tried to maintain different principles; they maintain the same principles for all things. But they swallow the difficulty we stated first as if they took it to be something trifling.

(11) The inquiry that is both the hardest of all and the most necessary for knowledge of the truth is whether being and unity are the substances of things, and whether each of them, without being anything else, is being or unity respectively, or we must inquire what being and unity are, with the implication that they have some other underlying nature. For some people think they are of the former, others think they are of the latter character. Plato and the Pythagoreans thought being and unity were nothing else, but this was their nature, their essence being

just unity and being. But the natural philosophers take a different line; e.g. Empedocles – as though reducing to something more intelligible – says what unity is; for he would seem to say it is love: at least, this is for all things the cause of their being one. Others say this unity and being, of which things consist and have been made, is fire, and others say it is air. A similar view is expressed by those who make the elements more than one; for these also must say that unity and being are precisely all the things which they say are principles.

(A) If we do not suppose unity and being to be substances, it follows that none of the other universals is a substance; for these are most universal of all, and if there is no unity-itself or being-itself, there will scarcely be in any other case anything apart from what are called the individuals. Further, if unity is not a substance, evidently number also will not exist as an entity separate from the individual things; for number is units, and the unit is precisely a certain kind of one.

But (B) if there is a unity-itself and a being-itself, unity and being must be their substance; for it is not something else that is predicated universally of the things that are and are one, but just unity and being. But if there is to be a being-itself and a unity-itself, there is much difficulty in seeing how there will be anything else besides these, – I mean, how things will be more than one in number. For what is different from being does not exist, so that it necessarily follows, according to the argument of Parmenides, that all things that are are one and this is being.

There are objections to both views. For whether unity is not a substance or there is a unity-itself, number cannot be a substance. We have already said why this result follows if unity is not a substance; and if it is, the same difficulty arises as arose with regard to being. For whence is there to be another one

besides unity-itself? It must be not-one; but all things are either one or many, and of the many each is one.

Further, if unity-itself is indivisible, according to Zeno's postulate it will be nothing. For that which neither when added makes a thing greater nor when subtracted makes it less, he asserts to have no being, evidently assuming that whatever has being is a spatial magnitude. And if it is a magnitude, it is corporeal; for the corporeal has being in every dimension, while the other objects of mathematics, e.g. a plane or a line, added in one way will increase what they are added to, but in another way will not do so, and a point or a unit does so in no way. But, since his theory is of a low order, and an indivisible thing can exist in such a way as to have a defence even against him (for the indivisible when added will make the number, though not the size, greater), – yet how can a magnitude proceed from one such indivisible or from many? It is like saying that the line is made out of points.

But even if ore supposes the case to be such that, as some say, number proceeds from unity-itself and something else which is not one, none the less we must inquire why and how the product will be sometimes a number and sometimes a magnitude, if the not-one was inequality and was the same principle in either case. For it is not evident how magnitudes could proceed either from the one and this principle, or from some number and this principle.

5

(14) A question connected with these is whether numbers and bodies and planes and points are substances of a kind, or not. If they are not, it baffles us to say what being is and what the

substances of things are. For modifications and movements and relations and dispositions and ratios do not seem to indicate the substance of anything; for all are predicated of a subject, and none is a 'this'. And as to the things which might seem most of all to indicate substance, water and earth and fire and air, of which composite bodies consist, heat and cold and the like are modifications of these, not substances, and the body which is thus modified alone persists as something real and as a substance. But, on the other hand, the body is surely less of a substance than the surface, and the surface than the line, and the line than the unit and the point. For the body is bounded by these; and they are thought to be capable of existing without body, but body incapable of existing without these. This is why, while most of the philosophers and the earlier among them thought that substance and being were identical with body, and that all other things were modifications of this, so that the first principles of the bodies were the first principles of being, the more recent and those who were held to be wiser thought numbers were the first principles. As we said, then, if these are not substance, there is no substance and no being at all; for the accidents of these it cannot be right to call beings.

But if this is admitted, that lines and points are substance more than bodies, but we do not see to what sort of bodies these could belong (for they cannot be in perceptible bodies), there can be no substance. – Further, these are all evidently divisions of body, – one in breadth, another in depth, another in length. Besides this, no sort of shape is present in the solid more than any other; so that if the Hermes is not in the stone, neither is the half of the cube in the cube as something determinate; therefore the surface is not in it either; for if any sort of surface were in it, the surface which marks off the half of the cube would be in it too. And the same account applies to the line and to the point and the unit. Therefore, if on the one hand body is in the highest degree substance, and on the other hand these

things are so more than body, but these are not even instances of substance, it baffles us to say what being is and what the substance of things is. – For besides what has been said, the questions of generation and instruction confront us with further paradoxes. For if substance, not having existed before, now exists, or having existed before, afterwards does not exist, this change is thought to be accompanied by a process of becoming or perishing; but points and lines and surfaces cannot be in process either of becoming or of perishing, when they at one time exist and at another do not. For when bodies come into contact or are divided, their boundaries simultaneously become one in the one case when they touch, and two in the other – when they are divided; so that when they have been put together one boundary does not exist but has perished, and when they have been divided the boundaries exist which before did not exist (for it cannot be said that the point, which is indivisible, was divided into two). And if the boundaries come into being and cease to be, from what do they come into being? A similar account may also be given of the 'now' in time; for this also cannot be in process of coming into being or of ceasing to be, but yet seems to be always different, which shows that it is not a substance. And evidently the same is true of points and lines and planes; for the same argument applies, since they are all alike either limits or divisions.

6

In general one might raise the question why after all, besides perceptible things and the intermediates, we have to look for another class of things, i.e. the Forms which we posit. If it is for this reason, because the objects of mathematics, while they differ from the things in this world in some other respect, differ

not at all in that there are many of the same kind, so that their first principles cannot be limited in number (just as the elements of all the language in this sensible world are not limited in number, but in kind, unless one takes the elements of this individual syllable or of this individual articulate sound – whose elements will be limited even in number; so is it also in the case of the intermediates; for there also the members of the same kind are infinite in number), so that if there are not – besides perceptible and mathematical objects – others such as some maintain the Forms to be, there will be no substance which is one in number, but only in kind, nor will the first principles of things be determinate in number, but only in kind: – if then this must be so, the Forms also must therefore be held to exist. Even if those who support this view do not express it articulately, still this is what they mean, and they must be maintaining the Forms just because each of the Forms is a substance and none is by accident.

But if we are to suppose both that the Forms exist and that the principles are one in number, not in kind, we have mentioned the impossible results that necessarily follow.

(13) Closely connected with this is the question whether the elements exist potentially or in some other manner. If in some other way, there will be something else prior to the first principles; for the potency is prior to the actual cause, and it is not necessary for everything potential to be actual. – But if the elements exist potentially, it is possible that everything that is should not be. For even that which is not yet is capable of being; for that which is not comes to be, but nothing that is incapable of being comes to be.

(12) We must not only raise these questions about the first principles, but also ask whether they are universal or what we call individuals. If they are universal, they will not be

substances; for everything that is common indicates not a 'this' but a 'such', but substance is a 'this'. And if we are to be allowed to lay it down that a common predicate is a 'this' and a single thing, Socrates will be several animals – himself and 'man' and 'animal', if each of these indicates a 'this' and a single thing.

If, then, the principles are universals, these universal. Therefore if there is to be results follow; if they are not universals but of knowledge of the principles there must be the nature of individuals, they will not be other principles prior to them, namely those knowable; for the knowledge of anything is that are universally predicated of them.

Book Γ

1

There is a science which investigates being as being and the attributes which belong to this in virtue of its own nature. Now this is not the same as any of the so-called special sciences; for none of these others treats universally of being as being. They cut off a part of being and investigate the attribute of this part; this is what the mathematical sciences for instance do. Now since we are seeking the first principles and the highest causes, clearly there must be some thing to which these belong in virtue of its own nature. If then those who sought the elements of existing things were seeking these same principles, it is necessary that the elements must be elements of being not by

accident but just because it is being. Therefore it is of being as being that we also must grasp the first causes.

2

There are many senses in which a thing may be said to 'be', but all that 'is' is related to one central point, one definite kind of thing, and is not said to 'be' by a mere ambiguity. Everything which is healthy is related to health, one thing in the sense that it preserves health, another in the sense that it produces it, another in the sense that it is a symptom of health, another because it is capable of it. And that which is medical is relative to the medical art, one thing being called medical because it possesses it, another because it is naturally adapted to it, another because it is a function of the medical art. And we shall find other words used similarly to these. So, too, there are many senses in which a thing is said to be, but all refer to one starting-point; some things are said to be because they are substances, others because they are affections of substance, others because they are a process towards substance, or destructions or privations or qualities of substance, or productive or generative of substance, or of things which are relative to substance, or negations of one of these thing of substance itself. It is for this reason that we say even of non-being that it is nonbeing. As, then, there is one science which deals with all healthy things, the same applies in the other cases also. For not only in the case of things which have one common notion does the investigation belong to one science, but also in the case of things which are related to one common nature; for even these in a sense have one common notion. It is clear then that it is the work of one science also to study the things that are, qua being. – But everywhere science deals

chiefly with that which is primary, and on which the other things depend, and in virtue of which they get their names. If, then, this is substance, it will be of substances that the philosopher must grasp the principles and the causes.

Now for each one class of things, as there is one perception, so there is one science, as for instance grammar, being one science, investigates all articulate sounds. Hence to investigate all the species of being qua being is the work of a science which is generically one, and to investigate the several species is the work of the specific parts of the science.

If, now, being and unity are the same and are one thing in the sense that they are implied in one another as principle and cause are, not in the sense that they are explained by the same definition (though it makes no difference even if we suppose them to be like that – in fact this would even strengthen our case); for 'one man' and 'man' are the same thing, and so are 'existent man' and 'man', and the doubling of the words in 'one man and one existent man' does not express anything different (it is clear that the two things are not separated either in coming to be or in ceasing to be); and similarly 'one existent man' adds nothing to 'existent man', and that it is obvious that the addition in these cases means the same thing, and unity is nothing apart from being; and if, further, the substance of each thing is one in no merely accidental way, and similarly is from its very nature something that is: – all this being so, there must be exactly as many species of being as of unity. And to investigate the essence of these is the work of a science which is generically one – I mean, for instance, the discussion of the same and the similar and the other concepts of this sort; and nearly all contraries may be referred to this origin; let us take them as having been investigated in the 'Selection of Contraries'.

And there are as many parts of philosophy as there are kinds of substance, so that there must necessarily be among them a first philosophy and one which follows this. For being falls immediately into genera; for which reason the sciences too will correspond to these genera. For the philosopher is like the mathematician, as that word is used; for mathematics also has parts, and there is a first and a second science and other successive ones within the sphere of mathematics.

Now since it is the work of one science to investigate opposites, and plurality is opposed to unity – and it belongs to one science to investigate the negation and the privation because in both cases we are really investigating the one thing of which the negation or the privation is a negation or privation (for we either say simply that that thing is not present, or that it is not present in some particular class; in the latter case difference is present over and above what is implied in negation; for negation means just the absence of the thing in question, while in privation there is also employed an underlying nature of which the privation is asserted): – in view of all these facts, the contraries of the concepts we named above, the other and the dissimilar and the unequal, and everything else which is derived either from these or from plurality and unity, must fall within the province of the science above named. And contrariety is one of these concepts; for contrariety is a kind of difference, and difference is a kind of otherness. Therefore, since there are many senses in which a thing is said to be one, these terms also will have many senses, but yet it belongs to one science to know them all; for a term belongs to different sciences not if it has different senses, but if it has not one meaning and its definitions cannot be referred to one central meaning. And since all things are referred to that which is primary, as for instance all things which are called one are referred to the primary one, we must say that this holds good also of the same and the other and of contraries in general; so

that after distinguishing the various senses of each, we must then explain by reference to what is primary in the case of each of the predicates in question, saying how they are related to it; for some will be called what they are called because they possess it, others because they produce it, and others in other such ways.

It is evident, then, that it belongs to one science to be able to give an account of these concepts as well as of substance (this was one of the questions in our book of problems), and that it is the function of the philosopher to be able to investigate all things. For if it is not the function of the philosopher, who is it who will inquire whether Socrates and Socrates seated are the same thing, or whether one thing has one contrary, or what contrariety is, or how many meanings it has? And similarly with all other such questions. Since, then, these are essential modifications of unity qua unity and of being qua being, not qua numbers or lines or fire, it is clear that it belongs to this science to investigate both the essence of these concepts and their properties. And those who study these properties err not by leaving the sphere of philosophy, but by forgetting that substance, of which they have no correct idea, is prior to these other things. For number qua number has peculiar attributes, such as oddness and evenness, commensurability and equality, excess and defect, and these belong to numbers either in themselves or in relation to one another. And similarly the solid and the motionless and that which is in motion and the weightless and that which has weight have other peculiar properties. So too there are certain properties peculiar to being as such, and it is about these that the philosopher has to investigate the truth. – An indication of this may be mentioned: dialecticians and sophists assume the same guise as the philosopher, for sophistic is Wisdom which exists only in semblance, and dialecticians embrace all things in their dialectic, and being is common to all things; but evidently their

dialectic embraces these subjects because these are proper to philosophy. – For sophistic and dialectic turn on the same class of things as philosophy, but this differs from dialectic in the nature of the faculty required and from sophistic in respect of the purpose of the philosophic life. Dialectic is merely critical where philosophy claims to know, and sophistic is what appears to be philosophy but is not.

Again, in the list of contraries one of the two columns is privative, and all contraries are reducible to being and non-being, and to unity and plurality, as for instance rest belongs to unity and movement to plurality. And nearly all thinkers agree that being and substance are composed of contraries; at least all name contraries as their first principles – some name odd and even, some hot and cold, some limit and the unlimited, some love and strife. And all the others as well are evidently reducible to unity and plurality (this reduction we must take for granted), and the principles stated by other thinkers fall entirely under these as their genera. It is obvious then from these considerations too that it belongs to one science to examine being qua being. For all things are either contraries or composed of contraries, and unity and plurality are the starting-points of all contraries. And these belong to one science, whether they have or have not one single meaning. Probably the truth is that they have not; yet even if 'one' has several meanings, the other meanings will be related to the primary meaning (and similarly in the case of the contraries), even if being or unity is not a universal and the same in every instance or is not separable from the particular instances (as in fact it probably is not; the unity is in some cases that of common reference, in some cases that of serial succession). And for this reason it does not belong to the geometer to inquire what is contrariety or completeness or unity or being or the same or the other, but only to presuppose these concepts and reason from this starting-point. – Obviously then it is the work of one science to examine being

qua being, and the attributes which belong to it qua being, and the same science will examine not only substances but also their attributes, both those above named and the concepts 'prior' and 'posterior', 'genus' and 'species', 'whole' and 'part', and the others of this sort.

3

We must state whether it belongs to one or to different sciences to inquire into the truths which are in mathematics called axioms, and into substance. Evidently, the inquiry into these also belongs to one science, and that the science of the philosopher; for these truths hold good for everything that is, and not for some special genus apart from others. And all men use them, because they are true of being qua being and each genus has being. But men use them just so far as to satisfy their purposes; that is, as far as the genus to which their demonstrations refer extends. Therefore since these truths clearly hold good for all things qua being (for this is what is common to them), to him who studies being qua being belongs the inquiry into these as well. And for this reason no one who is conducting a special inquiry tries to say anything about their truth or falsity, – neither the geometer nor the arithmetician. Some natural philosophers indeed have done so, and their procedure was intelligible enough; for they thought that they alone were inquiring about the whole of nature and about being. But since there is one kind of thinker who is above even the natural philosopher (for nature is only one particular genus of being), the discussion of these truths also will belong to him whose inquiry is universal and deals with primary substance. Physics also is a kind of Wisdom, but it is not the first kind. – And the attempts of some of those who discuss the terms on

which truth should be accepted, are due to a want of training in logic; for they should know these things already when they come to a special study, and not be inquiring into them while they are listening to lectures on it.

Evidently then it belongs to the philosopher, i.e. to him who is studying the nature of all substance, to inquire also into the principles of syllogism. But he who knows best about each genus must be able to state the most certain principles of his subject, so that he whose subject is existing things qua existing must be able to state the most certain principles of all things. This is the philosopher, and the most certain principle of all is that regarding which it is impossible to be mistaken; for such a principle must be both the best known (for all men may be mistaken about things which they do not know), and non-hypothetical. For a principle which every one must have who understands anything that is, is not a hypothesis; and that which every one must know who knows anything, he must already have when he comes to a special study. Evidently then such a principle is the most certain of all; which principle this is, let us proceed to say. It is, that the same attribute cannot at the same time belong and not belong to the same subject and in the same respect; we must presuppose, to guard against dialectical objections, any further qualifications which might be added. This, then, is the most certain of all principles, since it answers to the definition given above. For it is impossible for any one to believe the same thing to be and not to be, as some think Heraclitus says. For what a man says, he does not necessarily believe; and if it is impossible that contrary attributes should belong at the same time to the same subject (the usual qualifications must be presupposed in this premiss too), and if an opinion which contradicts another is contrary to it, obviously it is impossible for the same man at the same time to believe the same thing to be and not to be; for if a man were mistaken on this point he would have contrary opinions at the

same time. It is for this reason that all who are carrying out a demonstration reduce it to this as an ultimate belief; for this is naturally the starting-point even for all the other axioms.

4

There are some who, as we said, both themselves assert that it is possible for the same thing to be and not to be, and say that people can judge this to be the case. And among others many writers about nature use this language. But we have now posited that it is impossible for anything at the same time to be and not to be, and by this means have shown that this is the most indisputable of all principles. – Some indeed demand that even this shall be demonstrated, but this they do through want of education, for not to know of what things one should demand demonstration, and of what one should not, argues want of education. For it is impossible that there should be demonstration of absolutely everything (there would be an infinite regress, so that there would still be no demonstration); but if there are things of which one should not demand demonstration, these persons could not say what principle they maintain to be more self-evident than the present one.

We can, however, demonstrate negatively even that this view is impossible, if our opponent will only say something; and if he says nothing, it is absurd to seek to give an account of our views to one who cannot give an account of anything, in so far as he cannot do so. For such a man, as such, is from the start no better than a vegetable. Now negative demonstration I distinguish from demonstration proper, because in a demonstration one might be thought to be begging the question, but if another person is responsible for the

assumption we shall have negative proof, not demonstration. The starting-point for all such arguments is not the demand that our opponent shall say that something either is or is not (for this one might perhaps take to be a begging of the question), but that he shall say something which is significant both for himself and for another; for this is necessary, if he really is to say anything. For, if he means nothing, such a man will not be capable of reasoning, either with himself or with another. But if any one grants this, demonstration will be possible; for we shall already have something definite. The person responsible for the proof, however, is not he who demonstrates but he who listens; for while disowning reason he listens to reason. And again he who admits this has admitted that something is true apart from demonstration (so that not everything will be 'so and not so').

First then this at least is obviously true, that the word 'be' or 'not be' has a definite meaning, so that not everything will be 'so and not so'. Again, if 'man' has one meaning, let this be 'two-footed animal'; by having one meaning I understand this: – if 'man' means 'X', then if A is a man 'X' will be what 'being a man' means for him. (It makes no difference even if one were to say a word has several meanings, if only they are limited in number; for to each definition there might be assigned a different word. For instance, we might say that 'man' has not one meaning but several, one of which would have one definition, viz. 'two-footed animal', while there might be also several other definitions if only they were limited in number; for a peculiar name might be assigned to each of the definitions. If, however, they were not limited but one were to say that the word has an infinite number of meanings, obviously reasoning would be impossible; for not to have one meaning is to have no meaning, and if words have no meaning our reasoning with one another, and indeed with ourselves, has been annihilated; for it is impossible to think of anything if we do not think of one

thing; but if this is possible, one name might be assigned to this thing.)

Let it be assumed then, as was said at the beginning, that the name has a meaning and has one meaning; it is impossible, then, that 'being a man' should mean precisely 'not being a man', if 'man' not only signifies something about one subject but also has one significance (for we do not identify 'having one significance' with 'signifying something about one subject', since on that assumption even 'musical' and 'white' and 'man' would have had one significance, so that all things would have been one; for they would all have had the same significance).

And it will not be possible to be and not to be the same thing, except in virtue of an ambiguity, just as if one whom we call 'man', others were to call 'not-man'; but the point in question is not this, whether the same thing can at the same time be and not be a man in name, but whether it can in fact. Now if 'man' and 'not-man' mean nothing different, obviously 'not being a man' will mean nothing different from 'being a man'; so that 'being a man' will be 'not being a man'; for they will be one. For being one means this – being related as 'raiment' and 'dress' are, if their definition is one. And if 'being a man' and 'being a not-man' are to be one, they must mean one thing. But it was shown earlier that they mean different things. – Therefore, if it is true to say of anything that it is a man, it must be a two-footed animal (for this was what 'man' meant); and if this is necessary, it is impossible that the same thing should not at that time be a two-footed animal; for this is what 'being necessary' means – that it is impossible for the thing not to be. It is, then, impossible that it should be at the same time true to say the same thing is a man and is not a man.

The same account holds good with regard to 'not being a man', for 'being a man' and 'being a not-man' mean different things,

since even ‘being white’ and ‘being a man’ are different; for the former terms are much more different so that they must a fortiori mean different things. And if any one says that ‘white’ means one and the same thing as ‘man’, again we shall say the same as what was said before, that it would follow that all things are one, and not only opposites. But if this is impossible, then what we have maintained will follow, if our opponent will only answer our question.

And if, when one asks the question simply, he adds the contradictories, he is not answering the question. For there is nothing to prevent the same thing from being both a man and white and countless other things: but still, if one asks whether it is or is not true to say that this is a man, our opponent must give an answer which means one thing, and not add that ‘it is also white and large’. For, besides other reasons, it is impossible to enumerate its accidental attributes, which are infinite in number; let him, then, enumerate either all or none. Similarly, therefore, even if the same thing is a thousand times a man and a not-man, he must not, in answering the question whether this is a man, add that it is also at the same time a not-man, unless he is bound to add also all the other accidents, all that the subject is or is not; and if he does this, he is not observing the rules of argument.

And in general those who say this do away with substance and essence. For they must say that all attributes are accidents, and that there is no such thing as ‘being essentially a man’ or ‘an animal’. For if there is to be any such thing as ‘being essentially a man’ this will not be ‘being a not-man’ or ‘not being a man’ (yet these are negations of it); for there was one thing which it meant, and this was the substance of something. And denoting the substance of a thing means that the essence of the thing is nothing else. But if its being essentially a man is to be the same as either being essentially a not-man or essentially not being a

man, then its essence will be something else. Therefore our opponents must say that there cannot be such a definition of anything, but that all attributes are accidental; for this is the distinction between substance and accident – 'white' is accidental to man, because though he is white, whiteness is not his essence. But if all statements are accidental, there will be nothing primary about which they are made, if the accidental always implies predication about a subject. The predication, then, must go on ad infinitum. But this is impossible; for not even more than two terms can be combined in accidental predication. For (1) an accident is not an accident of an accident, unless it be because both are accidents of the same subject. I mean, for instance, that the white is musical and the latter is white, only because both are accidental to man. But (2) Socrates is musical, not in this sense, that both terms are accidental to something else. Since then some predicates are accidental in this and some in that sense, (a) those which are accidental in the latter sense, in which white is accidental to Socrates, cannot form an infinite series in the upward direction; e.g. Socrates the white has not yet another accident; for no unity can be got out of such a sum. Nor again (b) will 'white' have another term accidental to it, e.g. 'musical'. For this is no more accidental to that than that is to this; and at the same time we have drawn the distinction, that while some predicates are accidental in this sense, others are so in the sense in which 'musical' is accidental to Socrates; and the accident is an accident of an accident not in cases of the latter kind, but only in cases of the other kind, so that not all terms will be accidental. There must, then, even so be something which denotes substance. And if this is so, it has been shown that contradictories cannot be predicated at the same time.

Again, if all contradictory statements are true of the same subject at the same time, evidently all things will be one. For the same thing will be a trireme, a wall, and a man, if of everything

it is possible either to affirm or to deny anything (and this premiss must be accepted by those who share the views of Protagoras). For if any one thinks that the man is not a trireme, evidently he is not a trireme; so that he also is a trireme, if, as they say, contradictory statements are both true. And we thus get the doctrine of Anaxagoras, that all things are mixed together; so that nothing really exists. They seem, then, to be speaking of the indeterminate, and, while fancying themselves to be speaking of being, they are speaking about non-being; for it is that which exists potentially and not in complete reality that is indeterminate. But they must predicate of every subject the affirmation or the negation of every attribute. For it is absurd if of each subject its own negation is to be predicable, while the negation of something else which cannot be predicated of it is not to be predicable of it; for instance, if it is true to say of a man that he is not a man, evidently it is also true to say that he is either a trireme or not a trireme. If, then, the affirmative can be predicated, the negative must be predicable too; and if the affirmative is not predicable, the negative, at least, will be more predicable than the negative of the subject itself. If, then, even the latter negative is predicable, the negative of 'trireme' will be also predicable; and, if this is predicable, the affirmative will be so too.

Those, then, who maintain this view are driven to this conclusion, and to the further conclusion that it is not necessary either to assert or to deny. For if it is true that a thing is a man and a not-man, evidently also it will be neither a man nor a not-man. For to the two assertions there answer two negations, and if the former is treated as a single proposition compounded out of two, the latter also is a single proposition opposite to the former.

Again, either the theory is true in all cases, and a thing is both white and not-white, and existent and non-existent, and all

other assertions and negations are similarly compatible or the theory is true of some statements and not of others. And if not of all, the exceptions will be contradictories of which admittedly only one is true; but if of all, again either the negation will be true wherever the assertion is, and the assertion true wherever the negation is, or the negation will be true where the assertion is, but the assertion not always true where the negation is. And (a) in the latter case there will be something which fixedly is not, and this will be an indisputable belief; and if non-being is something indisputable and knowable, the opposite assertion will be more knowable. But (b) if it is equally possible also to assert all that it is possible to deny, one must either be saying what is true when one separates the predicates (and says, for instance, that a thing is white, and again that it is not-white), or not. And if (i) it is not true to apply the predicates separately, our opponent is not saying what he professes to say, and also nothing at all exists; but how could non-existent things speak or walk, as he does? Also all things would on this view be one, as has been already said, and man and God and trireme and their contradictories will be the same. For if contradictories can be predicated alike of each subject, one thing will in no wise differ from another; for if it differ, this difference will be something true and peculiar to it. And (ii) if one may with truth apply the predicates separately, the above-mentioned result follows none the less, and, further, it follows that all would then be right and all would be in error, and our opponent himself confesses himself to be in error. – And at the same time our discussion with him is evidently about nothing at all; for he says nothing. For he says neither 'yes' nor 'no', but 'yes and no'; and again he denies both of these and says 'neither yes nor no'; for otherwise there would already be something definite.

Again if when the assertion is true, the negation is false, and when this is true, the affirmation is false, it will not be possible

to assert and deny the same thing truly at the same time. But perhaps they might say this was the very question at issue.

Again, is he in error who judges either that the thing is so or that it is not so, and is he right who judges both? If he is right, what can they mean by saying that the nature of existing things is of this kind? And if he is not right, but more right than he who judges in the other way, being will already be of a definite nature, and this will be true, and not at the same time also not true. But if all are alike both wrong and right, one who is in this condition will not be able either to speak or to say anything intelligible; for he says at the same time both 'yes' and 'no.' And if he makes no judgement but 'thinks' and 'does not think', indifferently, what difference will there be between him and a vegetable? – Thus, then, it is in the highest degree evident that neither any one of those who maintain this view nor any one else is really in this position. For why does a man walk to Megara and not stay at home, when he thinks he ought to be walking there? Why does he not walk early some morning into a well or over a precipice, if one happens to be in his way? Why do we observe him guarding against this, evidently because he does not think that falling in is alike good and not good? Evidently, then, he judges one thing to be better and another worse. And if this is so, he must also judge one thing to be a man and another to be not-a-man, one thing to be sweet and another to be not-sweet. For he does not aim at and judge all things alike, when, thinking it desirable to drink water or to see a man, he proceeds to aim at these things; yet he ought, if the same thing were alike a man and not-a-man. But, as was said, there is no one who does not obviously avoid some things and not others. Therefore, as it seems, all men make unqualified judgements, if not about all things, still about what is better and worse. And if this is not knowledge but opinion, they should be all the more anxious about the truth, as a sick man should be more anxious about his health than one who is healthy; for he

who has opinions is, in comparison with the man who knows, not in a healthy state as far as the truth is concerned.

Again, however much all things may be 'so and not so', still there is a more and a less in the nature of things; for we should not say that two and three are equally even, nor is he who thinks four things are five equally wrong with him who thinks they are a thousand. If then they are not equally wrong, obviously one is less wrong and therefore more right. If then that which has more of any quality is nearer the norm, there must be some truth to which the more true is nearer. And even if there is not, still there is already something better founded and liker the truth, and we shall have got rid of the unqualified doctrine which would prevent us from determining anything in our thought.

5

From the same opinion proceeds the doctrine of Protagoras, and both doctrines must be alike true or alike untrue. For on the one hand, if all opinions and appearances are true, all statements must be at the same time true and false. For many men hold beliefs in which they conflict with one another, and think those mistaken who have not the same opinions as themselves; so that the same thing must both be and not be. And on the other hand, if this is so, all opinions must be true; for those who are mistaken and those who are right are opposed to one another in their opinions; if, then, reality is such as the view in question supposes, all will be right in their beliefs.

Evidently, then, both doctrines proceed from the same way of thinking. But the same method of discussion must not be used with all opponents; for some need persuasion, and others

compulsion. Those who have been driven to this position by difficulties in their thinking can easily be cured of their ignorance; for it is not their expressed argument but their thought that one has to meet. But those who argue for the sake of argument can be cured only by refuting the argument as expressed in speech and in words.

Those who really feel the difficulties have been led to this opinion by observation of the sensible world. (1) They think that contradictories or contraries are true at the same time, because they see contraries coming into existence out of the same thing. If, then, that which is not cannot come to be, the thing must have existed before as both contraries alike, as Anaxagoras says all is mixed in all, and Democritus too; for he says the void and the full exist alike in every part, and yet one of these is being, and the other non-being. To those, then, whose belief rests on these grounds, we shall say that in a sense they speak rightly and in a sense they err. For 'that which is' has two meanings, so that in some sense a thing can come to be out of that which is not, while in some sense it cannot, and the same thing can at the same time be in being and not in being – but not in the same respect. For the same thing can be potentially at the same time two contraries, but it cannot actually. And again we shall ask them to believe that among existing things there is also another kind of substance to which neither movement nor destruction nor generation at all belongs.

And (2) similarly some have inferred from observation of the sensible world the truth of appearances. For they think that the truth should not be determined by the large or small number of those who hold a belief, and that the same thing is thought sweet by some when they taste it, and bitter by others, so that if all were ill or all were mad, and only two or three were well or sane, these would be thought ill and mad, and not the others.

And again, they say that many of the other animals receive impressions contrary to ours; and that even to the senses of each individual, things do not always seem the same. Which, then, of these impressions are true and which are false is not obvious; for the one set is no more true than the other, but both are alike. And this is why Democritus, at any rate, says that either there is no truth or to us at least it is not evident.

And in general it is because these thinkers suppose knowledge to be sensation, and this to be a physical alteration, that they say that what appears to our senses must be true; for it is for these reasons that both Empedocles and Democritus and, one may almost say, all the others have fallen victims to opinions of this sort. For Empedocles says that when men change their condition they change their knowledge;

For wisdom increases in men according to what is before them.

And elsewhere he says that: –

So far as their nature changed, so far to them always

Came changed thoughts into mind.

And Parmenides also expresses himself in the same way:

For as at each time the much-bent limbs are composed,

So is the mind of men; for in each and all men

'Tis one thing thinks – the substance of their limbs:

For that of which there is more is thought.

A saying of Anaxagoras to some of his friends is also related, – that things would be for them such as they supposed them to be. And they say that Homer also evidently had this opinion, because he made Hector, when he was unconscious from the

blow, lie 'thinking other thoughts', – which implies that even those who are bereft of thought have thoughts, though not the same thoughts. Evidently, then, if both are forms of knowledge, the real things also are at the same time 'both so and not so'. And it is in this direction that the consequences are most difficult. For if those who have seen most of such truth as is possible for us (and these are those who seek and love it most) – if these have such opinions and express these views about the truth, is it not natural that beginners in philosophy should lose heart? For to seek the truth would be to follow flying game.

But the reason why these thinkers held this opinion is that while they were inquiring into the truth of that which is, they thought, 'that which is' was identical with the sensible world; in this, however, there is largely present the nature of the indeterminate – of that which exists in the peculiar sense which we have explained; and therefore, while they speak plausibly, they do not say what is true (for it is fitting to put the matter so rather than as Epicharmus put it against Xenophanes). And again, because they saw that all this world of nature is in movement and that about that which changes no true statement can be made, they said that of course, regarding that which everywhere in every respect is changing, nothing could truly be affirmed. It was this belief that blossomed into the most extreme of the views above mentioned, that of the professed Heracliteans, such as was held by Cratylus, who finally did not think it right to say anything but only moved his finger, and criticized Heraclitus for saying that it is impossible to step twice into the same river; for he thought one could not do it even once.

But we shall say in answer to this argument also that while there is some justification for their thinking that the changing, when it is changing, does not exist, yet it is after all disputable; for that which is losing a quality has something of that which is

being lost, and of that which is coming to be, something must already be. And in general if a thing is perishing, will be present something that exists; and if a thing is coming to be, there must be something from which it comes to be and something by which it is generated, and this process cannot go on ad infinitum. – But, leaving these arguments, let us insist on this, that it is not the same thing to change in quantity and in quality. Grant that in quantity a thing is not constant; still it is in respect of its form that we know each thing. – And again, it would be fair to criticize those who hold this view for asserting about the whole material universe what they saw only in a minority even of sensible things. For only that region of the sensible world which immediately surrounds us is always in process of destruction and generation; but this is – so to speak – not even a fraction of the whole, so that it would have been juster to acquit this part of the world because of the other part, than to condemn the other because of this. – And again, obviously we shall make to them also the same reply that we made long ago; we must show them and persuade them that there is something whose nature is changeless. Indeed, those who say that things at the same time are and are not, should in consequence say that all things are at rest rather than that they are in movement; for there is nothing into which they can change, since all attributes belong already to all subjects.

Regarding the nature of truth, we must maintain that not everything which appears is true; firstly, because even if sensation – at least of the object peculiar to the sense in question – is not false, still appearance is not the same as sensation. – Again, it is fair to express surprise at our opponents' raising the question whether magnitudes are as great, and colours are of such a nature, as they appear to people at a distance, or as they appear to those close at hand, and whether they are such as they appear to the healthy or to the sick, and whether those things are heavy which appear so to the

weak or those which appear so to the strong, and those things true which appear to the slee ing or to the waking. For obviously they do not think these to be open questions; no one, at least, if when he is in Libya he has fancied one night that he is in Athens, starts for the concert hall. – And again with regard to the future, as Plato says, surely the opinion of the physician and that of the ignorant man are not equally weighty, for instance, on the question whether a man will get well or not. – And again, among sensations themselves the sensation of a foreign object and that of the appropriate object, or that of a kindred object and that of the object of the sense in question, are not equally authoritative, but in the case of colour sight, not taste, has the authority, and in the case of flavour taste, not sight; each of which senses never says at the same time of the same object that it simultaneously is 'so and not so'. – But not even at different times does one sense disagree about the quality, but only about that to which the quality belongs. I mean, for instance, that the same wine might seem, if either it or one's body changed, at one time sweet and at another time not sweet; but at least the sweet, such as it is when it exists, has never yet changed, but one is always right about it, and that which is to be sweet is of necessity of such and such a nature. Yet all these views destroy this necessity, leaving nothing to be of necessity, as they leave no essence of anything; for the necessary cannot be in this way and also in that, so that if anything is of necessity, it will not be 'both so and not so'.

And, in general, if only the sensible exists, there would be nothing if animate things were not; for there would be no faculty of sense. Now the view that neither the sensible qualities nor the sensations would exist is doubtless true (for they are affections of the perceiver), but that the substrata which cause the sensation should not exist even apart from sensation is impossible. For sensation is surely not the sensation of itself, but there is something beyond the sensation,

which must be prior to the sensation; for that which moves is prior in nature to that which is moved, and if they are correlative terms, this is no less the case.

6

There are, both among those who have these convictions and among those who merely profess these views, some who raise a difficulty by asking, who is to be the judge of the healthy man, and in general who is likely to judge rightly on each class of questions. But such inquiries are like puzzling over the question whether we are now asleep or awake. And all such questions have the same meaning. These people demand that a reason shall be given for everything; for they seek a starting-point, and they seek to get this by demonstration, while it is obvious from their actions that they have no conviction. But their mistake is what we have stated it to be; they seek a reason for things for which no reason can be given; for the starting-point of demonstration is not demonstration.

These, then, might be easily persuaded of this truth, for it is not difficult to grasp; but those who seek merely compulsion in argument seek what is impossible; for they demand to be allowed to contradict themselves – a claim which contradicts itself from the very first. – But if not all things are relative, but some are self-existent, not everything that appears will be true; for that which appears is apparent to some one; so that he who says all things that appear are true, makes all things relative. And, therefore, those who ask for an irresistible argument, and at the same time demand to be called to account for their views, must guard themselves by saying that the truth is not that what appears exists, but that what appears exists for him to whom it

appears, and when, and to the sense to which, and under the conditions under which it appears. And if they give an account of their view, but do not give it in this way, they will soon find themselves contradicting themselves. For it is possible that the same thing may appear to be honey to the sight, but not to the taste, and that, since we have two eyes, things may not appear the same to each, if their sight is unlike. For to those who for the reasons named some time ago say that what appears is true, and therefore that all things are alike false and true, for things do not appear either the same to all men or always the same to the same man, but often have contrary appearances at the same time (for touch says there are two objects when we cross our fingers, while sight says there is one) – to these we shall say 'yes, but not to the same sense and in the same part of it and under the same conditions and at the same time', so that what appears will be with these qualifications true. But perhaps for this reason those who argue thus not because they feel a difficulty but for the sake of argument, should say that this is not true, but true for this man. And as has been said before, they must make everything relative – relative to opinion and perception, so that nothing either has come to be or will be without some one's first thinking so. But if things have come to be or will be, evidently not all things will be relative to opinion. – Again, if a thing is one, it is in relation to one thing or to a definite number of things; and if the same thing is both half and equal, it is not to the double that the equal is correlative. If, then, in relation to that which thinks, man and that which is thought are the same, man will not be that which thinks, but only that which is thought. And if each thing is to be relative to that which thinks, that which thinks will be relative to an infinity of specifically different things.

Let this, then, suffice to show (1) that the most indisputable of all beliefs is that contradictory statements are not at the same time true, and (2) what consequences follow from the assertion

that they are, and (3) why people do assert this. Now since it is impossible that contradictories should be at the same time true of the same thing, obviously contraries also cannot belong at the same time to the same thing. For of contraries, one is a privation no less than it is a contrary – and a privation of the essential nature; and privation is the denial of a predicate to a determinate genus. If, then, it is impossible to affirm and deny truly at the same time, it is also impossible that contraries should belong to a subject at the same time, unless both belong to it in particular relations, or one in a particular relation and one without qualification.

7

But on the other hand there cannot be an intermediate between contradictories, but of one subject we must either affirm or deny any one predicate. This is clear, in the first place, if we define what the true and the false are. To say of what is that it is not, or of what is not that it is, is false, while to say of what is that it is, and of what is not that it is not, is true; so that he who says of anything that it is, or that it is not, will say either what is true or what is false; but neither what is nor what is not is said to be or not to be. – Again, the intermediate between the contradictories will be so either in the way in which grey is between black and white, or as that which is neither man nor horse is between man and horse. (a) If it were of the latter kind, it could not change into the extremes (for change is from not-good to good, or from good to not-good), but as a matter of fact when there is an intermediate it is always observed to change into the extremes. For there is no change except to opposites and to their intermediates. (b) But if it is really intermediate, in this way too there would have to be a change to white, which

was not from not-white; but as it is, this is never seen. – Again, every object of understanding or reason the understanding either affirms or denies – this is obvious from the definition – whenever it says what is true or false. When it connects in one way by assertion or negation, it says what is true, and when it does so in another way, what is false. – Again, there must be an intermediate between all contradictories, if one is not arguing merely for the sake of argument; so that it will be possible for a man to say what is neither true nor untrue, and there will be a middle between that which is and that which is not, so that there will also be a kind of change intermediate between generation and destruction. – Again, in all classes in which the negation of an attribute involves the assertion of its contrary, even in these there will be an intermediate; for instance, in the sphere of numbers there will be number which is neither odd nor not-odd. But this is impossible, as is obvious from the definition. – Again, the process will go on ad infinitum, and the number of realities will be not only half as great again, but even greater. For again it will be possible to deny this intermediate with reference both to its assertion and to its negation, and this new term will be some definite thing; for its essence is something different. – Again, when a man, on being asked whether a thing is white, says 'no', he has denied nothing except that it is; and its not being is a negation.

Some people have acquired this opinion as other paradoxical opinions have been acquired; when men cannot refute eristical arguments, they give in to the argument and agree that the conclusion is true. This, then, is why some express this view; others do so because they demand a reason for everything. And the starting-point in dealing with all such people is definition. Now the definition rests on the necessity of their meaning something; for the form of words of which the word is a sign will be its definition. – While the doctrine of Heraclitus, that all things are and are not, seems to make everything true, that of

Anaxagoras, that there is an intermediate between the terms of a contradiction, seems to make everything false; for when things are mixed, the mixture is neither good nor not-good, so that one cannot say anything that is true.

8

In view of these distinctions it is obvious that the one-sided theories which some people express about all things cannot be valid – on the one hand the theory that nothing is true (for, say they, there is nothing to prevent every statement from being like the statement 'the diagonal of a square is commensurate with the side'), on the other hand the theory that everything is true. These views are practically the same as that of Heraclitus; for he who says that all things are true and all are false also makes each of these statements separately, so that since they are impossible, the double statement must be impossible too. – Again, there are obviously contradictories which cannot be at the same time true – nor on the other hand can all statements be false; yet this would seem more possible in the light of what has been said. – But against all such views we must postulate, as we said above,' not that something is or is not, but that something has a meaning, so that we must argue from a definition, viz. by assuming what falsity or truth means. If that which it is true to affirm is nothing other than that which it is false to deny, it is impossible that all statements should be false; for one side of the contradiction must be true. Again, if it is necessary with regard to everything either to assert or to deny it, it is impossible that both should be false; for it is one side of the contradiction that is false. – Therefore all such views are also exposed to the often expressed objection, that they destroy themselves. For he who says that everything is true makes even

the statement contrary to his own true, and therefore his own not true (for the contrary statement denies that it is true), while he who says everything is false makes himself also false. – And if the former person excepts the contrary statement, saying it alone is not true, while the latter excepts his own as being not false, none the less they are driven to postulate the truth or falsity of an infinite number of statements; for that which says the true statement is true is true, and this process will go on to infinity.

Evidently, again, those who say all things are at rest are not right, nor are those who say all things are in movement. For if all things are at rest, the same statements will always be true and the same always false, – but this obviously changes; for he who makes a statement, himself at one time was not and again will not be. And if all things are in motion, nothing will be true; everything therefore will be false. But it has been shown that this is impossible. Again, it must be that which is that changes; for change is from something to something. But again it is not the case that all things are at rest or in motion sometimes, and nothing for ever; for there is something which always moves the things that are in motion, and the first mover is itself unmoved.

Book Δ

1

‘Beginning’ means (1) that part of a thing from which one would start first, e.g a line or a road has a beginning in either of the contrary directions. (2) That from which each thing would best be originated, e.g. even in learning we must sometimes begin not from the first point and the beginning of the subject, but from the point from which we should learn most easily. (4) That from which, as an immanent part, a thing first comes to be, e,g, as the keel of a ship and the foundation of a house, while in animals some suppose the heart, others the brain, others some other part, to be of this nature. (4) That from which, not as an immanent part, a thing first comes to be, and from which the movement or the change naturally first begins, as a child comes from its father and its mother, and a fight from abusive language. (5) That at whose will that which is moved is moved and that which changes changes, e.g. the magistracies in cities, and oligarchies and monarchies and tyrannies, are called arhchai, and so are the arts, and of these especially the architectonic arts. (6) That from which a thing can first be known, – this also is called the beginning of the thing, e.g. the hypotheses are the beginnings of demonstrations. (Causes are spoken of in an equal number of senses; for all causes are beginnings.) It is common, then, to all beginnings to be the first point from which a thing either is or comes to be or is known; but of these some are immanent in the thing and others are outside. Hence the nature of a thing is a beginning, and so is the element of a thing, and thought and will, and essence, and the final cause – for the good and the beautiful are the beginning both of the knowledge and of the movement of many things.

2

‘Cause’ means (1) that from which, as immanent material, a thing comes into being, e.g. the bronze is the cause of the statue and the silver of the saucer, and so are the classes which include these. (2) The form or pattern, i.e. the definition of the essence, and the classes which include this (e.g. the ratio 2:1 and number in general are causes of the octave), and the parts included in the definition. (3) That from which the change or the resting from change first begins; e.g. the adviser is a cause of the action, and the father a cause of the child, and in general the maker a cause of the thing made and the change-producing of the changing. (4) The end, i.e. that for the sake of which a thing is; e.g. health is the cause of walking. For ‘Why does one walk?’ we say; ‘that one may be healthy’; and in speaking thus we think we have given the cause. The same is true of all the means that intervene before the end, when something else has put the process in motion, as e.g. thinning or purging or drugs or instruments intervene before health is reached; for all these are for the sake of the end, though they differ from one another in that some are instruments and others are actions.

These, then, are practically all the senses in which causes are spoken of, and as they are spoken of in several senses it follows both that there are several causes of the same thing, and in no accidental sense (e.g. both the art of sculpture and the bronze are causes of the statue not in respect of anything else but qua statue; not, however, in the same way, but the one as matter and the other as source of the movement), and that things can be causes of one another (e.g. exercise of good condition, and the latter of exercise; not, however, in the same way, but the one as end and the other as source of movement). – Again, the same

thing is the cause of contraries; for that which when present causes a particular thing, we sometimes charge, when absent, with the contrary, e.g. we impute the shipwreck to the absence of the steersman, whose presence was the cause of safety; and both – the presence and the privation – are causes as sources of movement.

All the causes now mentioned fall under four senses which are the most obvious. For the letters are the cause of syllables, and the material is the cause of manufactured things, and fire and earth and all such things are the causes of bodies, and the parts are causes of the whole, and the hypotheses are causes of the conclusion, in the sense that they are that out of which these respectively are made; but of these some are cause as the substratum (e.g. the parts), others as the essence (the whole, the synthesis, and the form). The semen, the physician, the adviser, and in general the agent, are all sources of change or of rest. The remainder are causes as the end and the good of the other things; for that for the sake of which other things are tends to be the best and the end of the other things; let us take it as making no difference whether we call it good or apparent good.

These, then, are the causes, and this is the number of their kinds, but the varieties of causes are many in number, though when summarized these also are comparatively few. Causes are spoken of in many senses, and even of those which are of the same kind some are causes in a prior and others in a posterior sense, e.g. both 'the physician' and 'the professional man' are causes of health, and both 'the ratio 2:1' and 'number' are causes of the octave, and the classes that include any particular cause are always causes of the particular effect. Again, there are accidental causes and the classes which include these; e.g. while in one sense 'the sculptor' causes the statue, in another sense 'Polyclitus' causes it, because the sculptor happens to be Polyclitus; and the classes that include the accidental cause are

also causes, e.g. 'man' – or in general 'animal' – is the cause of the statue, because Polyclitus is a man, and man is an animal. Of accidental causes also some are more remote or nearer than others, as, for instance, if 'the white' and 'the musical' were called causes of the statue, and not only 'Polyclitus' or 'man'. But besides all these varieties of causes, whether proper or accidental, some are called causes as being able to act, others as acting; e.g. the cause of the house's being built is a builder, or a builder who is building. – The same variety of language will be found with regard to the effects of causes; e.g. a thing may be called the cause of this statue or of a statue or in general of an image, and of this bronze or of bronze or of matter in general; and similarly in the case of accidental effects. Again, both accidental and proper causes may be spoken of in combination; e.g. we may say not 'Polyclitus' nor 'the sculptor' but 'Polyclitus the sculptor'. Yet all these are but six in number, while each is spoken of in two ways; for (A) they are causes either as the individual, or as the genus, or as the accidental, or as the genus that includes the accidental, and these either as combined, or as taken simply; and (B) all may be taken as acting or as having a capacity. But they differ inasmuch as the acting causes, i.e. the individuals, exist, or do not exist, simultaneously with the things of which they are causes, e.g. this particular man who is healing, with this particular man who is recovering health, and this particular builder with this particular thing that is being built; but the potential causes are not always in this case; for the house does not perish at the same time as the builder.

3

'Element' means (1) the primary component immanent in a thing, and indivisible in kind into other kinds; e.g. the elements

of speech are the parts of which speech consists and into which it is ultimately divided, while they are no longer divided into other forms of speech different in kind from them. If they are divided, their parts are of the same kind, as a part of water is water (while a part of the syllable is not a syllable). Similarly those who speak of the elements of bodies mean the things into which bodies are ultimately divided, while they are no longer divided into other things differing in kind; and whether the things of this sort are one or more, they call these elements. The so-called elements of geometrical proofs, and in general the elements of demonstrations, have a similar character; for the primary demonstrations, each of which is implied in many demonstrations, are called elements of demonstrations; and the primary syllogisms, which have three terms and proceed by means of one middle, are of this nature.

(2) People also transfer the word 'element' from this meaning and apply it to that which, being one and small, is useful for many purposes; for which reason what is small and simple and indivisible is called an element. Hence come the facts that the most universal things are elements (because each of them being one and simple is present in a plurality of things, either in all or in as many as possible), and that unity and the point are thought by some to be first principles. Now, since the so-called genera are universal and indivisible (for there is no definition of them), some say the genera are elements, and more so than the differentia, because the genus is more universal; for where the differentia is present, the genus accompanies it, but where the genus is present, the differentia is not always so. It is common to all the meanings that the element of each thing is the first component immanent in each.

4

‘Nature’ means (1) the genesis of growing things – the meaning which would be suggested if one were to pronounce the ‘u’ in phusis long. – (2) That immanent part of a growing thing, from which its growth first proceeds. – (3) The source from which the primary movement in each natural object is present in it in virtue of its own essence. Those things are said to grow which derive increase from something else by contact and either by organic unity, or by organic adhesion as in the case of embryos. Organic unity differs from contact; for in the latter case there need not be anything besides the contact, but in organic unities there is something identical in both parts, which makes them grow together instead of merely touching, and be one in respect of continuity and quantity, though not of quality. – (4) ‘Nature’ means the primary material of which any natural object consists or out of which it is made, which is relatively unshaped and cannot be changed from its own potency, as e.g. bronze is said to be the nature of a statue and of bronze utensils, and wood the nature of wooden things; and so in all other cases; for when a product is made out of these materials, the first matter is preserved throughout. For it is in this way that people call the elements of natural objects also their nature, some naming fire, others earth, others air, others water, others something else of the sort, and some naming more than one of these, and others all of them. – (5) ‘Nature’ means the essence of natural objects, as with those who say the nature is the primary mode of composition, or as Empedocles says: –

Nothing that is has a nature,

But only mixing and parting of the mixed,

And nature is but a name given them by men.

Hence as regards the things that are or come to be by nature, though that from which they naturally come to be or are is already present, we say they have not their nature yet, unless they have their form or shape. That which comprises both of these exists by nature, e.g. the animals and their parts; and not only is the first matter nature (and this in two senses, either the first, counting from the thing, or the first in general; e.g. in the case of works in bronze, bronze is first with reference to them, but in general perhaps water is first, if all things that can be melted are water), but also the form or essence, which is the end of the process of becoming. – (6) By an extension of meaning from this sense of 'nature' every essence in general has come to be called a 'nature', because the nature of a thing is one kind of essence.

From what has been said, then, it is plain that nature in the primary and strict sense is the essence of things which have in themselves, as such, a source of movement; for the matter is called the nature because it is qualified to receive this, and processes of becoming and growing are called nature because they are movements proceeding from this. And nature in this sense is the source of the movement of natural objects, being present in them somehow, either potentially or in complete reality.

5

We call 'necessary' (1) (a) that without which, as a condition, a thing cannot live; e.g. breathing and food are necessary for an animal; for it is incapable of existing without these; (b) the conditions without which good cannot be or come to be, or without which we cannot get rid or be freed of evil; e.g. drinking

the medicine is necessary in order that we may be cured of disease, and a man's sailing to Aegina is necessary in order that he may get his money. – (2) The compulsory and compulsion, i.e. that which impedes and tends to hinder, contrary to impulse and purpose. For the compulsory is called necessary (whence the necessary is painful, as Evenus says: 'For every necessary thing is ever irksome'), and compulsion is a form of necessity, as Sophocles says: 'But force necessitates me to this act'. And necessity is held to be something that cannot be persuaded – and rightly, for it is contrary to the movement which accords with purpose and with reasoning. – (3) We say that that which cannot be otherwise is necessarily as it is. And from this sense of 'necessary' all the others are somehow derived; for a thing is said to do or suffer what is necessary in the sense of compulsory, only when it cannot act according to its impulse because of the compelling forces – which implies that necessity is that because of which a thing cannot be otherwise; and similarly as regards the conditions of life and of good; for when in the one case good, in the other life and being, are not possible without certain conditions, these are necessary, and this kind of cause is a sort of necessity. Again, demonstration is a necessary thing because the conclusion cannot be otherwise, if there has been demonstration in the unqualified sense; and the causes of this necessity are the first premisses, i.e. the fact that the propositions from which the syllogism proceeds cannot be otherwise.

Now some things owe their necessity to something other than themselves; others do not, but are themselves the source of necessity in other things. Therefore the necessary in the primary and strict sense is the simple; for this does not admit of more states than one, so that it cannot even be in one state and also in another; for if it did it would already be in more than one. If, then, there are any things that are eternal and

unmovable, nothing compulsory or against their nature attaches to them.

6

‘One’ means (1) that which is one by accident, (2) that which is one by its own nature. (1) Instances of the accidentally one are ‘Coriscus and what is musical’, and ‘musical Coriscus’ (for it is the same thing to say ‘Coriscus and what is musical’, and ‘musical Coriscus’), and ‘what is musical and what is just’, and ‘musical Coriscus and just Coriscus’. For all of these are called one by virtue of an accident, ‘what is just and what is musical’ because they are accidents of one substance, ‘what is musical and Coriscus’ because the one is an accident of the other; and similarly in a sense ‘musical Coriscus’ is one with ‘Coriscus’ because one of the parts of the phrase is an accident of the other, i.e. ‘musical’ is an accident of Coriscus; and ‘musical Coriscus’ is one with ‘just Coriscus’ because one part of each is an accident of one and the same subject. The case is similar if the accident is predicated of a genus or of any universal name, e.g. if one says that man is the same as ‘musical man’; for this is either because ‘musical’ is an accident of man, which is one substance, or because both are accidents of some individual, e.g. Coriscus. Both, however, do not belong to him in the same way, but one presumably as genus and included in his substance, the other as a state or affection of the substance.

The things, then, that are called one in virtue of an accident, are called so in this way. (2) Of things that are called one in virtue of their own nature some (a) are so called because they are continuous, e.g. a bundle is made one by a band, and pieces of wood are made one by glue; and a line, even if it is bent, is

called one if it is continuous, as each part of the body is, e.g. the leg or the arm. Of these themselves, the continuous by nature are more one than the continuous by art. A thing is called continuous which has by its own nature one movement and cannot have any other; and the movement is one when it is indivisible, and it is indivisible in respect of time. Those things are continuous by their own nature which are one not merely by contact; for if you put pieces of wood touching one another, you will not say these are one piece of wood or one body or one continuum of any other sort. Things, then, that are continuous in any way called one, even if they admit of being bent, and still more those which cannot be bent; e.g. the shin or the thigh is more one than the leg, because the movement of the leg need not be one. And the straight line is more one than the bent; but that which is bent and has an angle we call both one and not one, because its movement may be either simultaneous or not simultaneous; but that of the straight line is always simultaneous, and no part of it which has magnitude rests while another moves, as in the bent line.

(b)(i) Things are called one in another sense because their substratum does not differ in kind; it does not differ in the case of things whose kind is indivisible to sense. The substratum meant is either the nearest to, or the farthest from, the final state. For, one the one hand, wine is said to be one and water is said to be one, qua indivisible in kind; and, on the other hand, all juices, e.g. oil and wine, are said to be one, and so are all things that can be melted, because the ultimate substratum of all is the same; for all of these are water or air.

(ii) Those things also are called one whose genus is one though distinguished by opposite differentiae – these too are all called one because the genus which underlies the differentiae is one (e.g. horse, man, and dog form a unity, because all are animals), and indeed in a way similar to that in which the matter is one.

These are sometimes called one in this way, but sometimes it is the higher genus that is said to be the same (if they are infimae species of their genus) – the genus above the proximate genera; e.g. the isosceles and the equilateral are one and the same figure because both are triangles; but they are not the same triangles.

(c) Two things are called one, when the definition which states the essence of one is indivisible from another definition which shows us the other (though in itself every definition is divisible). Thus even that which has increased or is diminishing is one, because its definition is one, as, in the case of plane figures, is the definition of their form. In general those things the thought of whose essence is indivisible, and cannot separate them either in time or in place or in definition, are most of all one, and of these especially those which are substances. For in general those things that do not admit of division are called one in so far as they do not admit of it; e.g. if two things are indistinguishable qua man, they are one kind of man; if qua animal, one kind of animal; if qua magnitude, one kind of magnitude. – Now most things are called one because they either do or have or suffer or are related to something else that is one, but the things that are primarily called one are those whose substance is one, – and one either in continuity or in form or in definition; for we count as more than one either things that are not continuous, or those whose form is not one, or those whose definition is not one.

While in a sense we call anything one if it is a quantity and continuous, in a sense we do not unless it is a whole, i.e. unless it has unity of form; e.g. if we saw the parts of a shoe put together anyhow we should not call them one all the same (unless because of their continuity); we do this only if they are put together so as to be a shoe and to have already a certain

single form. This is why the circle is of all lines most truly one, because it is whole and complete.

(3) The essence of what is one is to be some kind of beginning of number; for the first measure is the beginning, since that by which we first know each class is the first measure of the class; the one, then, is the beginning of the knowable regarding each class. But the one is not the same in all classes. For here it is a quarter-tone, and there it is the vowel or the consonant; and there is another unit of weight and another of movement. But everywhere the one is indivisible either in quantity or in kind. Now that which is indivisible in quantity is called a unit if it is not divisible in any dimension and is without position, a point if it is not divisible in any dimension and has position, a line if it is divisible in one dimension, a plane if in two, a body if divisible in quantity in all – i.e. in three – dimensions. And, reversing the order, that which is divisible in two dimensions is a plane, that which is divisible in one a line, that which is in no way divisible in quantity is a point or a unit, – that which has not position a unit, that which has position a point.

Again, some things are one in number, others in species, others in genus, others by analogy; in number those whose matter is one, in species those whose definition is one, in genus those to which the same figure of predication applies, by analogy those which are related as a third thing is to a fourth. The latter kinds of unity are always found when the former are; e.g. things that are one in number are also one in species, while things that are one in species are not all one in number; but things that are one in species are all one in genus, while things that are so in genus are not all one in species but are all one by analogy; while things that are one by analogy are not all one in genus.

Evidently 'many' will have meanings opposite to those of 'one'; some things are many because they are not continuous, others

because their matter – either the proximate matter or the ultimate – is divisible in kind, others because the definitions which state their essence are more than one.

7

Things are said to 'be' (1) in an accidental sense, (2) by their own nature.

(1) In an accidental sense, e.g. we say 'the righteous doer is musical', and 'the man is musical', and 'the musician is a man', just as we say 'the musician builds', because the builder happens to be musical or the musician to be a builder; for here 'one thing is another' means 'one is an accident of another'. So in the cases we have mentioned; for when we say 'the man is musical' and 'the musician is a man', or 'he who is pale is musical' or 'the musician is pale', the last two mean that both attributes are accidents of the same thing; the first that the attribute is an accident of that which is, while 'the musical is a man' means that 'musical' is an accident of a man. (In this sense, too, the not-pale is said to be, because that of which it is an accident is.) Thus when one thing is said in an accidental sense to be another, this is either because both belong to the same thing, and this is, or because that to which the attribute belongs is, or because the subject which has as an attribute that of which it is itself predicated, itself is.

(2) The kinds of essential being are precisely those that are indicated by the figures of predication; for the senses of 'being' are just as many as these figures. Since, then, some predicates indicate what the subject is, others its quality, others quantity, others relation, others activity or passivity, others its 'where', others its 'when', 'being' has a meaning answering to each of

these. For there is no difference between 'the man is recovering' and 'the man recovers', nor between 'the man is walking or cutting' and 'the man walks' or 'cuts'; and similarly in all other cases.

(3) Again, 'being' and 'is' mean that a statement is true, 'not being' that it is not true but false – and this alike in the case of affirmation and of negation; e.g. 'Socrates is musical' means that this is true, or 'Socrates is not-pale' means that this is true; but 'the diagonal of the square is not commensurate with the side' means that it is false to say it is.

(4) Again, 'being' and 'that which is' mean that some of the things we have mentioned 'are' potentially, others in complete reality. For we say both of that which sees potentially and of that which sees actually, that it is 'seeing', and both of that which can actualize its knowledge and of that which is actualizing it, that it knows, and both of that to which rest is already present and of that which can rest, that it rests. And similarly in the case of substances; we say the Hermes is in the stone, and the half of the line is in the line, and we say of that which is not yet ripe that it is corn. When a thing is potential and when it is not yet potential must be explained elsewhere.

8

We call 'substance' (1) the simple bodies, i.e. earth and fire and water and everything of the sort, and in general bodies and the things composed of them, both animals and divine beings, and the parts of these. All these are called substance because they are not predicated of a subject but everything else is predicated of them. – (2) That which, being present in such things as are not predicated of a subject, is the cause of their being, as the

soul is of the being of an animal. – (3) The parts which are present in such things, limiting them and marking them as individuals, and by whose destruction the whole is destroyed, as the body is by the destruction of the plane, as some say, and the plane by the destruction of the line; and in general number is thought by some to be of this nature; for if it is destroyed, they say, nothing exists, and it limits all things. – (4) The essence, the formula of which is a definition, is also called the substance of each thing.

It follows, then, that 'substance' has two senses, (A) ultimate substratum, which is no longer predicated of anything else, and (B) that which, being a 'this', is also separable and of this nature is the shape or form of each thing.

9

'The same' means (1) that which is the same in an accidental sense, e.g. 'the pale' and 'the musical' are the same because they are accidents of the same thing, and 'a man' and 'musical' because the one is an accident of the other; and 'the musical' is 'a man' because it is an accident of the man. (The complex entity is the same as either of the simple ones and each of these is the same as it; for both 'the man' and 'the musical' are said to be the same as 'the musical man', and this the same as they.) This is why all of these statements are made not universally; for it is not true to say that every man is the same as 'the musical' (for universal attributes belong to things in virtue of their own nature, but accidents do not belong to them in virtue of their own nature); but of the individuals the statements are made without qualification. For 'Socrates' and 'musical Socrates' are thought to be the same; but 'Socrates' is not predicable of more

than one subject, and therefore we do not say ‘every Socrates’ as we say ‘every man’.

Some things are said to be the same in this sense, others (2) are the same by their own nature, in as many senses as that which is one by its own nature is so; for both the things whose matter is one either in kind or in number, and those whose essence is one, are said to be the same. Clearly, therefore, sameness is a unity of the being either of more than one thing or of one thing when it is treated as more than one, ie. when we say a thing is the same as itself; for we treat it as two.

Things are called ‘other’ if either their kinds or their matters or the definitions of their essence are more than one; and in general ‘other’ has meanings opposite to those of ‘the same’.

‘Different’ is applied (1) to those things which though other are the same in some respect, only not in number but either in species or in genus or by analogy; (2) to those whose genus is other, and to contraries, and to an things that have their otherness in their essence.

Those things are called ‘like’ which have the same attributes in every respect, and those which have more attributes the same than different, and those whose quality is one; and that which shares with another thing the greater number or the more important of the attributes (each of them one of two contraries) in respect of which things are capable of altering, is like that other thing. The senses of ‘unlike’ are opposite to those of ‘like’.

10

The term ‘opposite’ is applied to contradictories, and to contraries, and to relative terms, and to privation and possession, and to the extremes from which and into which generation and dissolution take place; and the attributes that cannot be present at the same time in that which is receptive of both, are said to be opposed, – either themselves of their constituents. Grey and white colour do not belong at the same time to the same thing; hence their constituents are opposed.

The term ‘contrary’ is applied (1) to those attributes differing in genus which cannot belong at the same time to the same subject, (2) to the most different of the things in the same genus, (3) to the most different of the attributes in the same recipient subject, (4) to the most different of the things that fall under the same faculty, (5) to the things whose difference is greatest either absolutely or in genus or in species. The other things that are called contrary are so called, some because they possess contraries of the above kind, some because they are receptive of such, some because they are productive of or susceptible to such, or are producing or suffering them, or are losses or acquisitions, or possessions or privations, of such. Since ‘one’ and ‘being’ have many senses, the other terms which are derived from these, and therefore ‘same’, ‘other’, and ‘contrary’, must correspond, so that they must be different for each category.

The term ‘other in species’ is applied to things which being of the same genus are not subordinate the one to the other, or which being in the same genus have a difference, or which have a contrariety in their substance; and contraries are other than one another in species (either all contraries or those which are so called in the primary sense), and so are those things whose definitions differ in the infima species of the genus (e.g. man

and horse are indivisible in genus, but their definitions are different), and those which being in the same substance have a difference. 'The same in species' has the various meanings opposite to these.

11

The words 'prior' and 'posterior' are applied (1) to some things (on the assumption that there is a first, i.e. a beginning, in each class) because they are nearer some beginning determined either absolutely and by nature, or by reference to something or in some place or by certain people; e.g. things are prior in place because they are nearer either to some place determined by nature (e.g. the middle or the last place), or to some chance object; and that which is farther is posterior. – Other things are prior in time; some by being farther from the present, i.e. in the case of past events (for the Trojan war is prior to the Persian, because it is farther from the present), others by being nearer the present, i.e. in the case of future events (for the Nemean games are prior to the Pythian, if we treat the present as beginning and first point, because they are nearer the present). – Other things are prior in movement; for that which is nearer the first mover is prior (e.g. the boy is prior to the man); and the prime mover also is a beginning absolutely. – Others are prior in power; for that which exceeds in power, i.e. the more powerful, is prior; and such is that according to whose will the other – i.e. the posterior – must follow, so that if the prior does not set it in motion the other does not move, and if it sets it in motion it does move; and here will is a beginning. – Others are prior in arrangement; these are the things that are placed at intervals in reference to some one definite thing according to some rule, e.g. in the chorus the second man is prior to the third, and in the

lyre the second lowest string is prior to the lowest; for in the one case the leader and in the other the middle string is the beginning.

These, then, are called prior in this sense, but (2) in another sense that which is prior for knowledge is treated as also absolutely prior; of these, the things that are prior in definition do not coincide with those that are prior in relation to perception. For in definition universals are prior, in relation to perception individuals. And in definition also the accident is prior to the whole, e.g. 'musical' to 'musical man', for the definition cannot exist as a whole without the part; yet musicalness cannot exist unless there is some one who is musical.

(3) The attributes of prior things are called prior, e.g. straightness is prior to smoothness; for one is an attribute of a line as such, and the other of a surface.

Some things then are called prior and posterior in this sense, others (4) in respect of nature and substance, i.e. those which can be without other things, while the others cannot be without them, – a distinction which Plato used. (If we consider the various senses of 'being', firstly the subject is prior, so that substance is prior; secondly, according as potency or complete reality is taken into account, different things are prior, for some things are prior in respect of potency, others in respect of complete reality, e.g. in potency the half line is prior to the whole line, and the part to the whole, and the matter to the concrete substance, but in complete reality these are posterior; for it is only when the whole has been dissolved that they will exist in complete reality.) In a sense, therefore, all things that are called prior and posterior are so called with reference to this fourth sense; for some things can exist without others in respect of generation, e.g. the whole without the parts, and

others in respect of dissolution, e.g. the part without the whole. And the same is true in all other cases.

12

'Potency' means (1) a source of movement or change, which is in another thing than the thing moved or in the same thing qua other; e.g. the art of building is a potency which is not in the thing built, while the art of healing, which is a potency, may be in the man healed, but not in him qua healed. 'Potency' then means the source, in general, of change or movement in another thing or in the same thing qua other, and also (2) the source of a thing's being moved by another thing or by itself qua other. For in virtue of that principle, in virtue of which a patient suffers anything, we call it 'capable' of suffering; and this we do sometimes if it suffers anything at all, sometimes not in respect of everything it suffers, but only if it suffers a change for the better – (3) The capacity of performing this well or according to intention; for sometimes we say of those who merely can walk or speak but not well or not as they intend, that they cannot speak or walk. So too (4) in the case of passivity. – (5) The states in virtue of which things are absolutely impassive or unchangeable, or not easily changed for the worse, are called potencies; for things are broken and crushed and bent and in general destroyed not by having a potency but by not having one and by lacking something, and things are impassive with respect to such processes if they are scarcely and slightly affected by them, because of a 'potency' and because they 'can' do something and are in some positive state.

'Potency' having this variety of meanings, so too the 'potent' or 'capable' in one sense will mean that which can begin a

movement (or a change in general, for even that which can bring things to rest is a 'potent' thing) in another thing or in itself qua other; and in one sense that over which something else has such a potency; and in one sense that which has a potency of changing into something, whether for the worse or for the better (for even that which perishes is thought to be 'capable' of perishing, for it would not have perished if it had not been capable of it; but, as a matter of fact, it has a certain disposition and cause and principle which fits it to suffer this; sometimes it is thought to be of this sort because it has something, sometimes because it is deprived of something; but if privation is in a sense 'having' or 'habit', everything will be capable by having something, so that things are capable both by having a positive habit and principle, and by having the privation of this, if it is possible to have a privation; and if privation is not in a sense 'habit', 'capable' is used in two distinct senses); and a thing is capable in another sense because neither any other thing, nor itself qua other, has a potency or principle which can destroy it. Again, all of these are capable either merely because the thing might chance to happen or not to happen, or because it might do so well. This sort of potency is found even in lifeless things, e.g. in instruments; for we say one lyre can speak, and another cannot speak at all, if it has not a good tone.

Incapacity is privation of capacity – i.e. of such a principle as has been described either in general or in the case of something that would naturally have the capacity, or even at the time when it would naturally already have it; for the senses in which we should call a boy and a man and a eunuch 'incapable of begetting' are distinct. – Again, to either kind of capacity there is an opposite incapacity – both to that which only can produce movement and to that which can produce it well.

Some things, then, are called adunata in virtue of this kind of incapacity, while others are so in another sense; i.e. both dunaton and adunaton are used as follows. The impossible is that of which the contrary is of necessity true, e.g. that the diagonal of a square is commensurate with the side is impossible, because such a statement is a falsity of which the contrary is not only true but also necessary; that it is commensurate, then, is not only false but also of necessity false. The contrary of this, the possible, is found when it is not necessary that the contrary is false, e.g. that a man should be seated is possible; for that he is not seated is not of necessity false. The possible, then, in one sense, as has been said, means that which is not of necessity false; in one, that which is true; in one, that which may be true. – A 'potency' or 'power' in geometry is so called by a change of meaning. – These senses of 'capable' or 'possible' involve no reference to potency. But the senses which involve a reference to potency all refer to the primary kind of potency; and this is a source of change in another thing or in the same thing qua other. For other things are called 'capable', some because something else has such a potency over them, some because it has not, some because it has it in a particular way. The same is true of the things that are incapable. Therefore the proper definition of the primary kind of potency will be 'a source of change in another thing or in the same thing qua other'.

13

'Quantum' means that which is divisible into two or more constituent parts of which each is by nature a 'one' and a 'this'. A quantum is a plurality if it is numerable, a magnitude if it is a measurable. 'Plurality' means that which is divisible potentially

into non-continuous parts, 'magnitude' that which is divisible into continuous parts; of magnitude, that which is continuous in one dimension is length; in two breadth, in three depth. Of these, limited plurality is number, limited length is a line, breadth a surface, depth a solid.

Again, some things are called quanta in virtue of their own nature, others incidentally; e.g. the line is a quantum by its own nature, the musical is one incidentally. Of the things that are quanta by their own nature some are so as substances, e.g. the line is a quantum (for 'a certain kind of quantum' is present in the definition which states what it is), and others are modifications and states of this kind of substance, e.g. much and little, long and short, broad and narrow, deep and shallow, heavy and light, and all other such attributes. And also great and small, and greater and smaller, both in themselves and when taken relatively to each other, are by their own nature attributes of what is quantitative; but these names are transferred to other things also. Of things that are quanta incidentally, some are so called in the sense in which it was said that the musical and the white were quanta, viz. because that to which musicalness and whiteness belong is a quantum, and some are quanta in the way in which movement and time are so; for these also are called quanta of a sort and continuous because the things of which these are attributes are divisible. I mean not that which is moved, but the space through which it is moved; for because that is a quantum movement also is a quantum, and because this is a quantum time is one.

14

'Quality' means (1) the differentia of the essence, e.g. man is an animal of a certain quality because he is two-footed, and the horse is so because it is four-footed; and a circle is a figure of particular quality because it is without angles, – which shows that the essential differentia is a quality. – This, then, is one meaning of quality – the differentia of the essence, but (2) there is another sense in which it applies to the unmovable objects of mathematics, the sense in which the numbers have a certain quality, e.g. the composite numbers which are not in one dimension only, but of which the plane and the solid are copies (these are those which have two or three factors); and in general that which exists in the essence of numbers besides quantity is quality; for the essence of each is what it is once, e.g. that of is not what it is twice or thrice, but what it is once; for 6 is once 6.

(3) All the modifications of substances that move (e.g. heat and cold, whiteness and blackness, heaviness and lightness, and the others of the sort) in virtue of which, when they change, bodies are said to alter. (4) Quality in respect of virtue and vice, and in general, of evil and good.

Quality, then, seems to have practically two meanings, and one of these is the more proper. The primary quality is the differentia of the essence, and of this the quality in numbers is a part; for it is a differentia of essences, but either not of things that move or not of them qua moving. Secondly, there are the modifications of things that move, qua moving, and the differentiae of movements. Virtue and vice fall among these modifications; for they indicate differentiae of the movement or activity, according to which the things in motion act or are acted on well or badly; for that which can be moved or act in one way is good, and that which can do so in another – the contrary – way is vicious. Good and evil indicate quality

especially in living things, and among these especially in those which have purpose.

15

Things are 'relative' (1) as double to half, and treble to a third, and in general that which contains something else many times to that which is contained many times in something else, and that which exceeds to that which is exceeded; (2) as that which can heat to that which can be heated, and that which can cut to that which can be cut, and in general the active to the passive; (3) as the measurable to the measure, and the knowable to knowledge, and the perceptible to perception.

(1) Relative terms of the first kind are numerically related either indefinitely or definitely, to numbers themselves or to 1. E.g. the double is in a definite numerical relation to 1, and that which is 'many times as great' is in a numerical, but not a definite, relation to 1, i.e. not in this or in that numerical relation to it; the relation of that which is half as big again as something else to that something is a definite numerical relation to a number; that which is n+I/n times something else is in an indefinite relation to that something, as that which is 'many times as great' is in an indefinite relation to 1; the relation of that which exceeds to that which is exceeded is numerically quite indefinite; for number is always commensurate, and 'number' is not predicated of that which is not commensurate, but that which exceeds is, in relation to that which is exceeded, so much and something more; and this something is indefinite; for it can, indifferently, be either equal or not equal to that which is exceeded. – All these relations, then, are numerically expressed and are determinations of number, and so in another way are

the equal and the like and the same. For all refer to unity. Those things are the same whose substance is one; those are like whose quality is one; those are equal whose quantity is one; and 1 is the beginning and measure of number, so that all these relations imply number, though not in the same way.

(2) Things that are active or passive imply an active or a passive potency and the actualizations of the potencies; e.g. that which is capable of heating is related to that which is capable of being heated, because it can heat it, and, again, that which heats is related to that which is heated and that which cuts to that which is cut, in the sense that they actually do these things. But numerical relations are not actualized except in the sense which has been elsewhere stated; actualizations in the sense of movement they have not. Of relations which imply potency some further imply particular periods of time, e.g. that which has made is relative to that which has been made, and that which will make to that which will be made. For it is in this way that a father is called the father of his son; for the one has acted and the other has been acted on in a certain way. Further, some relative terms imply privation of potency, i.e. 'incapable' and terms of this sort, e.g. 'invisible'.

Relative terms which imply number or potency, therefore, are all relative because their very essence includes in its nature a reference to something else, not because something else involves a reference to it; but (3) that which is measurable or knowable or thinkable is called relative because something else involves a reference to it. For 'that which is thinkable' implies that the thought of it is possible, but the thought is not relative to 'that of which it is the thought'; for we should then have said the same thing twice. Similarly sight is the sight of something, not 'of that of which it is the sight' (though of course it is true to say this); in fact it is relative to colour or to something else of

the sort. But according to the other way of speaking the same thing would be said twice, – 'the sight is of that of which it is.'

Things that are by their own nature called relative are called so sometimes in these senses, sometimes if the classes that include them are of this sort; e.g. medicine is a relative term because its genus, science, is thought to be a relative term. Further, there are the properties in virtue of which the things that have them are called relative, e.g. equality is relative because the equal is, and likeness because the like is. Other things are relative by accident; e.g. a man is relative because he happens to be double of something and double is a relative term; or the white is relative, if the same thing happens to be double and white.

16

What is called 'complete' is (1) that outside which it is not possible to find any, even one, of its parts; e.g. the complete time of each thing is that outside which it is not possible to find any time which is a part proper to it. – (2) That which in respect of excellence and goodness cannot be excelled in its kind; e.g. we have a complete doctor or a complete flute-player, when they lack nothing in respect of the form of their proper excellence. And thus, transferring the word to bad things, we speak of a complete scandal-monger and a complete thief; indeed we even call them good, i.e. a good thief and a good scandal-monger. And excellence is a completion; for each thing is complete and every substance is complete, when in respect of the form of its proper excellence it lacks no part of its natural magnitude. – (3) The things which have attained their end, this being good, are called complete; for things are complete in

virtue of having attained their end. Therefore, since the end is something ultimate, we transfer the word to bad things and say a thing has been completely spoilt, and completely destroyed, when it in no wise falls short of destruction and badness, but is at its last point. This is why death, too, is by a figure of speech called the end, because both are last things. But the ultimate purpose is also an end. – Things, then, that are called complete in virtue of their own nature are so called in all these senses, some because in respect of goodness they lack nothing and cannot be excelled and no part proper to them can be found outside them, others in general because they cannot be exceeded in their several classes and no part proper to them is outside them; the others presuppose these first two kinds, and are called complete because they either make or have something of the sort or are adapted to it or in some way or other involve a reference to the things that are called complete in the primary sense.

17

'Limit' means (1) the last point of each thing, i.e. the first point beyond which it is not possible to find any part, and the first point within which every part is; (2) the form, whatever it may be, of a spatial magnitude or of a thing that has magnitude; (3) the end of each thing (and of this nature is that towards which the movement and the action are, not that from which they are – though sometimes it is both, that from which and that to which the movement is, i.e. the final cause); (4) the substance of each thing, and the essence of each; for this is the limit of knowledge; and if of knowledge, of the object also. Evidently, therefore, 'limit' has as many senses as 'beginning', and yet

more; for the beginning is a limit, but not every limit is a beginning.

18

'That in virtue of which' has several meanings: – (1) the form or substance of each thing, e.g. that in virtue of which a man is good is the good itself, (2) the proximate subject in which it is the nature of an attribute to be found, e.g. colour in a surface. 'That in virtue of which', then, in the primary sense is the form, and in a secondary sense the matter of each thing and the proximate substratum of each. – In general 'that in virtue of which' will found in the same number of senses as 'cause'; for we say indifferently (3) in virtue of what has he come?' or 'for what end has he come?'; and (4) in virtue of what has he inferred wrongly, or inferred?' or 'what is the cause of the inference, or of the wrong inference?' – Further (5) Kath' d is used in reference to position, e.g. 'at which he stands' or 'along which he walks; for all such phrases indicate place and position.

Therefore 'in virtue of itself' must likewise have several meanings. The following belong to a thing in virtue of itself: – (1) the essence of each thing, e.g. Callias is in virtue of himself Callias and what it was to be Callias; – (2) whatever is present in the 'what', e.g. Callias is in virtue of himself an animal. For 'animal' is present in his definition; Callias is a particular animal. – (3) Whatever attribute a thing receives in itself directly or in one of its parts; e.g. a surface is white in virtue of itself, and a man is alive in virtue of himself; for the soul, in which life directly resides, is a part of the man. – (4) That which has no cause other than itself; man has more than one cause – animal,

two-footed – but yet man is man in virtue of himself. – (5) Whatever attributes belong to a thing alone, and in so far as they belong to it merely by virtue of itself considered apart by itself.

19

'Disposition' means the arrangement of that which has parts, in respect either of place or of potency or of kind; for there must be a certain position, as even the word 'disposition' shows.

20

'Having' means (1) a kind of activity of the haver and of what he has – something like an action or movement. For when one thing makes and one is made, between them there is a making; so too between him who has a garment and the garment which he has there is a having. This sort of having, then, evidently we cannot have; for the process will go on to infinity, if it is to be possible to have the having of what we have. – (2) 'Having' or 'habit' means a disposition according to which that which is disposed is either well or ill disposed, and either in itself or with reference to something else; e.g. health is a 'habit'; for it is such a disposition. – (3) We speak of a 'habit' if there is a portion of such a disposition; and so even the excellence of the parts is a 'habit' of the whole thing.

21

'Affection' means (1) a quality in respect of which a thing can be altered, e.g. white and black, sweet and bitter, heaviness and lightness, and all others of the kind. – (2) The actualization of these – the already accomplished alterations. – (3) Especially, injurious alterations and movements, and, above all painful injuries. – (4) Misfortunes and painful experiences when on a large scale are called affections.

22

We speak of 'privation' (1) if something has not one of the attributes which a thing might naturally have, even if this thing itself would not naturally have it; e.g. a plant is said to be 'deprived' of eyes. – (2) If, though either the thing itself or its genus would naturally have an attribute, it has it not; e.g. a blind man and a mole are in different senses 'deprived' of sight; the latter in contrast with its genus, the former in contrast with his own normal nature. – (3) If, though it would naturally have the attribute, and when it would naturally have it, it has it not; for blindness is a privation, but one is not 'blind' at any and every age, but only if one has not sight at the age at which one would naturally have it. Similarly a thing is called blind if it has not sight in the medium in which, and in respect of the organ in respect of which, and with reference to the object with reference to which, and in the circumstances in which, it would naturally have it. – (4) The violent taking away of anything is called privation.

Indeed there are just as many kinds of privations as there are of words with negative prefixes; for a thing is called unequal because it has not equality though it would naturally have it,

and invisible either because it has no colour at all or because it has a poor colour, and apodous either because it has no feet at all or because it has imperfect feet. Again, a privative term may be used because the thing has little of the attribute (and this means having it in a sense imperfectly), e.g. 'kernel-less'; or because it has it not easily or not well (e.g. we call a thing uncuttable not only if it cannot be cut but also if it cannot be cut easily or well); or because it has not the attribute at all; for it is not the one-eyed man but he who is sightless in both eyes that is called blind. This is why not every man is 'good' or 'bad', 'just' or 'unjust', but there is also an intermediate state.

23

To 'have' or 'hold' means many things: – (1) to treat a thing according to one's own nature or according to one's own impulse; so that fever is said to have a man, and tyrants to have their cities, and people to have the clothes they wear. – (2) That in which a thing is present as in something receptive of it is said to have the thing; e.g. the bronze has the form of the statue, and the body has the disease. – (3) As that which contains holds the things contained; for a thing is said to be held by that in which it is as in a container; e.g. we say that the vessel holds the liquid and the city holds men and the ship sailors; and so too that the whole holds the parts. – (4) That which hinders a thing from moving or acting according to its own impulse is said to hold it, as pillars hold the incumbent weights, and as the poets make Atlas hold the heavens, implying that otherwise they would collapse on the earth, as some of the natural philosophers also say. In this way also that which holds things together is said to hold the things it holds

together, since they would otherwise separate, each according to its own impulse.

'Being in something' has similar and corresponding meanings to 'holding' or 'having'.

24

'To come from something' means (1) to come from something as from matter, and this in two senses, either in respect of the highest genus or in respect of the lowest species; e.g. in a sense all things that can be melted come from water, but in a sense the statue comes from bronze. – (2) As from the first moving principle; e.g. 'what did the fight come from?' From abusive language, because this was the origin of the fight. – (3) From the compound of matter and shape, as the parts come from the whole, and the verse from the Iliad, and the stones from the house; (in every such case the whole is a compound of matter and shape,) for the shape is the end, and only that which attains an end is complete. – (4) As the form from its part, e.g. man from 'two-footed'and syllable from 'letter'; for this is a different sense from that in which the statue comes from bronze; for the composite substance comes from the sensible matter, but the form also comes from the matter of the form. – Some things, then, are said to come from something else in these senses; but (5) others are so described if one of these senses is applicable to a part of that other thing; e.g. the child comes from its father and mother, and plants come from the earth, because they come from a part of those things. – (6) It means coming after a thing in time, e.g. night comes from day and storm from fine weather, because the one comes after the other. Of these things some are so described because they admit

of change into one another, as in the cases now mentioned; some merely because they are successive in time, e.g. the voyage took place 'from' the equinox, because it took place after the equinox, and the festival of the Thargelia comes 'from' the Dionysia, because after the Dionysia.

25

'Part' means (1) (a) that into which a quantum can in any way be divided; for that which is taken from a quantum qua quantum is always called a part of it, e.g. two is called in a sense a part of three. It means (b), of the parts in the first sense, only those which measure the whole; this is why two, though in one sense it is, in another is not, called a part of three. – (2) The elements into which a kind might be divided apart from the quantity are also called parts of it; for which reason we say the species are parts of the genus. – (3) The elements into which a whole is divided, or of which it consists – the 'whole' meaning either the form or that which has the form; e.g. of the bronze sphere or of the bronze cube both the bronze – i.e. the matter in which the form is – and the characteristic angle are parts. – (4) The elements in the definition which explains a thing are also parts of the whole; this is why the genus is called a part of the species, though in another sense the species is part of the genus.

26

‘A whole’ means (1) that from which is absent none of the parts of which it is said to be naturally a whole, and (2) that which so contains the things it contains that they form a unity; and this in two senses – either as being each severally one single thing, or as making up the unity between them. For (a) that which is true of a whole class and is said to hold good as a whole (which implies that it is a kind whole) is true of a whole in the sense that it contains many things by being predicated of each, and by all of them, e.g. man, horse, god, being severally one single thing, because all are living things. But (b) the continuous and limited is a whole, when it is a unity consisting of several parts, especially if they are present only potentially, but, failing this, even if they are present actually. Of these things themselves, those which are so by nature are wholes in a higher degree than those which are so by art, as we said in the case of unity also, wholeness being in fact a sort of oneness.

Again (3) of quanta that have a beginning and a middle and an end, those to which the position does not make a difference are called totals, and those to which it does, wholes. Those which admit of both descriptions are both wholes and totals. These are the things whose nature remains the same after transposition, but whose form does not, e.g. wax or a coat; they are called both wholes and totals; for they have both characteristics. Water and all liquids and number are called totals, but ‘the whole number’ or ‘the whole water’ one does not speak of, except by an extension of meaning. To things, to which qua one the term ‘total’ is applied, the term ‘all’ is applied when they are treated as separate; ‘this total number,’ ‘all these units.’

27

It is not any chance quantitative thing that can be said to be 'mutilated'; it must be a whole as well as divisible. For not only is two not 'mutilated' if one of the two ones is taken away (for the part removed by mutilation is never equal to the remainder), but in general no number is thus mutilated; for it is also necessary that the essence remain; if a cup is mutilated, it must still be a cup; but the number is no longer the same. Further, even if things consist of unlike parts, not even these things can all be said to be mutilated, for in a sense a number has unlike parts (e.g. two and three) as well as like; but in general of the things to which their position makes no difference, e.g. water or fire, none can be mutilated; to be mutilated, things must be such as in virtue of their essence have a certain position. Again, they must be continuous; for a musical scale consists of unlike parts and has position, but cannot become mutilated. Besides, not even the things that are wholes are mutilated by the privation of any part. For the parts removed must be neither those which determine the essence nor any chance parts, irrespective of their position; e.g. a cup is not mutilated if it is bored through, but only if the handle or a projecting part is removed, and a man is mutilated not if the flesh or the spleen is removed, but if an extremity is, and that not every extremity but one which when completely removed cannot grow again. Therefore baldness is not a mutilation.

28

The term 'race' or 'genus' is used (1) if generation of things which have the same form is continuous, e.g. 'while the race of men lasts' means 'while the generation of them goes on

continuously'. – (2) It is used with reference to that which first brought things into existence; for it is thus that some are called Hellenes by race and others Ionians, because the former proceed from Hellen and the latter from Ion as their first begetter. And the word is used in reference to the begetter more than to the matter, though people also get a race-name from the female, e.g. 'the descendants of Pyrrha'. – (3) There is genus in the sense in which 'plane' is the genus of plane figures and solid' of solids; for each of the figures is in the one case a plane of such and such a kind, and in the other a solid of such and such a kind; and this is what underlies the differentiae. Again (4) in definitions the first constituent element, which is included in the 'what', is the genus, whose differentiae the qualities are said to be 'Genus' then is used in all these ways, (1) in reference to continuous generation of the same kind, (2) in reference to the first mover which is of the same kind as the things it moves, (3) as matter; for that to which the differentia or quality belongs is the substratum, which we call matter.

Those things are said to be 'other in genus' whose proximate substratum is different, and which are not analysed the one into the other nor both into the same thing (e.g. form and matter are different in genus); and things which belong to different categories of being (for some of the things that are said to 'be' signify essence, others a quality, others the other categories we have before distinguished); these also are not analysed either into one another or into some one thing.

29

'The false' means (1) that which is false as a thing, and that (a) because it is not put together or cannot be put together, e.g.

‘that the diagonal of a square is commensurate with the side’ or ‘that you are sitting’; for one of these is false always, and the other sometimes; it is in these two senses that they are non-existent. (b) There are things which exist, but whose nature it is to appear either not to be such as they are or to be things that do not exist, e.g. a sketch or a dream; for these are something, but are not the things the appearance of which they produce in us. We call things false in this way, then, – either because they themselves do not exist, or because the appearance which results from them is that of something that does not exist.

(2) A false account is the account of non-existent objects, in so far as it is false. Hence every account is false when applied to something other than that of which it is true; e.g. the account of a circle is false when applied to a triangle. In a sense there is one account of each thing, i.e. the account of its essence, but in a sense there are many, since the thing itself and the thing itself with an attribute are in a sense the same, e.g. Socrates and musical Socrates (a false account is not the account of anything, except in a qualified sense). Hence Antisthenes was too simple-minded when he claimed that nothing could be described except by the account proper to it, – one predicate to one subject; from which the conclusion used to be drawn that there could be no contradiction, and almost that there could be no error. But it is possible to describe each thing not only by the account of itself, but also by that of something else. This may be done altogether falsely indeed, but there is also a way in which it may be done truly; e.g. eight may be described as a double number by the use of the definition of two.

These things, then, are called false in these senses, but (3) a false man is one who is ready at and fond of such accounts, not for any other reason but for their own sake, and one who is good at impressing such accounts on other people, just as we say things are which produce a false appearance. This is why

the proof in the Hippias that the same man is false and true is misleading. For it assumes that he is false who can deceive (i.e. the man who knows and is wise); and further that he who is willingly bad is better. This is a false result of induction – for a man who limps willingly is better than one who does so unwillingly – by 'limping' Plato means 'mimicking a limp', for if the man were lame willingly, he would presumably be worse in this case as in the corresponding case of moral character.

30

'Accident' means (1) that which attaches to something and can be truly asserted, but neither of necessity nor usually, e.g. if some one in digging a hole for a plant has found treasure. This – the finding of treasure – is for the man who dug the hole an accident; for neither does the one come of necessity from the other or after the other, nor, if a man plants, does he usually find treasure. And a musical man might be pale; but since this does not happen of necessity nor usually, we call it an accident. Therefore since there are attributes and they attach to subjects, and some of them attach to these only in a particular place and at a particular time, whatever attaches to a subject, but not because it was this subject, or the time this time, or the place this place, will be an accident. Therefore, too, there is no definite cause for an accident, but a chance cause, i.e. an indefinite one. Going to Aegina was an accident for a man, if he went not in order to get there, but because he was carried out of his way by a storm or captured by pirates. The accident has happened or exists, – not in virtue of the subject's nature, however, but of something else; for the storm was the cause of his coming to a place for which he was not sailing, and this was Aegina.

‘Accident’ has also (2) another meaning, i.e. all that attaches to each thing in virtue of itself but is not in its essence, as having its angles equal to two right angles attaches to the triangle. And accidents of this sort may be eternal, but no accident of the other sort is. This is explained elsewhere.

Book E

1

We are seeking the principles and the causes of the things that are, and obviously of them qua being. For, while there is a cause of health and of good condition, and the objects of mathematics have first principles and elements and causes, and in general every science which is ratiocinative or at all involves reasoning deals with causes and principles, more or less precise, all these sciences mark off some particular being – some genus, and inquire into this, but not into being simply nor qua being, nor do they offer any discussion of the essence of the things of which they treat; but starting from the essence – some making it plain to the senses, others assuming it as a hypothesis – they then demonstrate, more or less cogently, the essential attributes of the genus with which they deal. It is obvious, therefore, that such an induction yields no demonstration of substance or of the essence, but some other way of exhibiting it. And similarly the sciences omit the question whether the genus with which

they deal exists or does not exist, because it belongs to the same kind of thinking to show what it is and that it is.

And since natural science, like other sciences, is in fact about one class of being, i.e. to that sort of substance which has the principle of its movement and rest present in itself, evidently it is neither practical nor productive. For in the case of things made the principle is in the maker – it is either reason or art or some faculty, while in the case of things done it is in the doer – viz. will, for that which is done and that which is willed are the same. Therefore, if all thought is either practical or productive or theoretical, physics must be a theoretical science, but it will theorize about such being as admits of being moved, and about substance – as defined for the most part only as not separable from matter. Now, we must not fail to notice the mode of being of the essence and of its definition, for, without this, inquiry is but idle. Of things defined, i.e. of 'whats', some are like 'snub', and some like 'concave'. And these differ because 'snub' is bound up with matter (for what is snub is a concave nose), while concavity is independent of perceptible matter. If then all natural things are a analogous to the snub in their nature; e.g. nose, eye, face, flesh, bone, and, in general, animal; leaf, root, bark, and, in general, plant (for none of these can be defined without reference to movement – they always have matter), it is clear how we must seek and define the 'what' in the case of natural objects, and also that it belongs to the student of nature to study even soul in a certain sense, i.e. so much of it as is not independent of matter.

That physics, then, is a theoretical science, is plain from these considerations. Mathematics also, however, is theoretical; but whether its objects are immovable and separable from matter, is not at present clear; still, it is clear that some mathematical theorems consider them qua immovable and qua separable from matter. But if there is something which is eternal and

immovable and separable, clearly the knowledge of it belongs to a theoretical science, – not, however, to physics (for physics deals with certain movable things) nor to mathematics, but to a science prior to both. For physics deals with things which exist separately but are not immovable, and some parts of mathematics deal with things which are immovable but presumably do not exist separately, but as embodied in matter; while the first science deals with things which both exist separately and are immovable. Now all causes must be eternal, but especially these; for they are the causes that operate on so much of the divine as appears to us. There must, then, be three theoretical philosophies, mathematics, physics, and what we may call theology, since it is obvious that if the divine is present anywhere, it is present in things of this sort. And the highest science must deal with the highest genus. Thus, while the theoretical sciences are more to be desired than the other sciences, this is more to be desired than the other theoretical sciences. For one might raise the question whether first philosophy is universal, or deals with one genus, i.e. some one kind of being; for not even the mathematical sciences are all alike in this respect, – geometry and astronomy deal with a certain particular kind of thing, while universal mathematics applies alike to all. We answer that if there is no substance other than those which are formed by nature, natural science will be the first science; but if there is an immovable substance, the science of this must be prior and must be first philosophy, and universal in this way, because it is first. And it will belong to this to consider being qua being – both what it is and the attributes which belong to it qua being.

2

But since the unqualified term 'being' has several meanings, of which one was seen' to be the accidental, and another the true ('non-being' being the false), while besides these there are the figures of predication (e.g. the 'what', quality, quantity, place, time, and any similar meanings which 'being' may have), and again besides all these there is that which 'is' potentially or actually: – since 'being' has many meanings, we must say regarding the accidental, that there can be no scientific treatment of it. This is confirmed by the fact that no science practical, productive, or theoretical troubles itself about it. For on the one hand he who produces a house does not produce all the attributes that come into being along with the house; for these are innumerable; the house that has been made may quite well be pleasant for some people, hurtful for some, and useful to others, and different – to put it shortly from all things that are; and the science of building does not aim at producing any of these attributes. And in the same way the geometer does not consider the attributes which attach thus to figures, nor whether 'triangle' is different from 'triangle whose angles are equal to two right angles'. – And this happens naturally enough; for the accidental is practically a mere name. And so Plato was in a sense not wrong in ranking sophistic as dealing with that which is not. For the arguments of the sophists deal, we may say, above all with the accidental; e.g. the question whether 'musical' and 'lettered' are different or the same, and whether 'musical Coriscus' and 'Coriscus' are the same, and whether 'everything which is, but is not eternal, has come to be', with the paradoxical conclusion that if one who was musical has come to be lettered, he must also have been lettered and have come to be musical, and all the other arguments of this sort; the accidental is obviously akin to non-being. And this is clear also from arguments such as the following: things which are in another sense come into being and pass out of being by a

process, but things which are accidentally do not. But still we must, as far as we can, say further, regarding the accidental, what its nature is and from what cause it proceeds; for it will perhaps at the same time become clear why there is no science of it.

Since, among things which are, some are always in the same state and are of necessity (not necessity in the sense of compulsion but that which we assert of things because they cannot be otherwise), and some are not of necessity nor always, but for the most part, this is the principle and this the cause of the existence of the accidental; for that which is neither always nor for the most part, we call accidental. For instance, if in the dog-days there is wintry and cold weather, we say this is an accident, but not if there is sultry heat, because the latter is always or for the most part so, but not the former. And it is an accident that a man is pale (for this is neither always nor for the most part so), but it is not by accident that he is an animal. And that the builder produces health is an accident, because it is the nature not of the builder but of the doctor to do this, – but the builder happened to be a doctor. Again, a confectioner, aiming at giving pleasure, may make something wholesome, but not in virtue of the confectioner's art; and therefore we say 'it was an accident', and while there is a sense in which he makes it, in the unqualified sense he does not. For to other things answer faculties productive of them, but to accidental results there corresponds no determinate art nor faculty; for of things which are or come to be by accident, the cause also is accidental. Therefore, since not all things either are or come to be of necessity and always, but, the majority of things are for the most part, the accidental must exist; for instance a pale man is not always nor for the most part musical, but since this sometimes happens, it must be accidental (if not, everything will be of necessity). The matter, therefore, which is capable of being otherwise than as it usually is, must be the cause of the

accidental. And we must take as our starting-point the question whether there is nothing that is neither always nor for the most part. Surely this is impossible. There is, then, besides these something which is fortuitous and accidental. But while the usual exists, can nothing be said to be always, or are there eternal things? This must be considered later,' but that there is no science of the accidental is obvious; for all science is either of that which is always or of that which is for the most part. (For how else is one to learn or to teach another? The thing must be determined as occurring either always or for the most part, e.g. that honey-water is useful for a patient in a fever is true for the most part.) But that which is contrary to the usual law science will be unable to state, i.e. when the thing does not happen, e.g.'on the day of new moon'; for even that which happens on the day of new moon happens then either always or for the most part; but the accidental is contrary to such laws. We have stated, then, what the accidental is, and from what cause it arises, and that there is no science which deals with it.

3

That there are principles and causes which are generable and destructible without ever being in course of being generated or destroyed, is obvious. For otherwise all things will be of necessity, since that which is being generated or destroyed must have a cause which is not accidentally its cause. Will A exist or not? It will if B happens; and if not, not. And B will exist if C happens. And thus if time is constantly subtracted from a limited extent of time, one will obviously come to the present. This man, then, will die by violence, if he goes out; and he will do this if he gets thirsty; and he will get thirsty if something else happens; and thus we shall come to that which is now

present, or to some past event. For instance, he will go out if he gets thirsty; and he will get thirsty if he is eating pungent food; and this is either the case or not; so that he will of necessity die, or of necessity not die. And similarly if one jumps over to past events, the same account will hold good; for this – I mean the past condition – is already present in something. Everything, therefore, that will be, will be of necessity; e.g. it is necessary that he who lives shall one day die; for already some condition has come into existence, e.g. the presence of contraries in the same body. But whether he is to die by disease or by violence is not yet determined, but depends on the happening of something else. Clearly then the process goes back to a certain starting-point, but this no longer points to something further. This then will be the starting-point for the fortuitous, and will have nothing else as cause of its coming to be. But to what sort of starting-point and what sort of cause we thus refer the fortuitous – whether to matter or to the purpose or to the motive power, must be carefully considered.

4

Let us dismiss accidental being; for we have sufficiently determined its nature. But since that which is in the sense of being true, or is not in the sense of being false, depends on combination and separation, and truth and falsity together depend on the allocation of a pair of contradictory judgements (for the true judgement affirms where the subject and predicate really are combined, and denies where they are separated, while the false judgement has the opposite of this allocation; it is another question, how it happens that we think things together or apart; by 'together' and 'apart' I mean thinking them so that there is no succession in the thoughts but they become a unity);

for falsity and truth are not in things – it is not as if the good were true, and the bad were in itself false – but in thought; while with regard to simple concepts and 'whats' falsity and truth do not exist even in thought – this being so, we must consider later what has to be discussed with regard to that which is or is not in this sense. But since the combination and the separation are in thought and not in the things, and that which is in this sense is a different sort of 'being' from the things that are in the full sense (for the thought attaches or removes either the subject's 'what' or its having a certain quality or quantity or something else), that which is accidentally and that which is in the sense of being true must be dismissed. For the cause of the former is indeterminate, and that of the latter is some affection of the thought, and both are related to the remaining genus of being, and do not indicate the existence of any separate class of being. Therefore let these be dismissed, and let us consider the causes and the principles of being itself, qua being. (It was clear in our discussion of the various meanings of terms, that 'being' has several meanings.)

Book Z

1

There are several senses in which a thing may be said to 'be', as we pointed out previously in our book on the various senses of words;' for in one sense the 'being' meant is 'what a thing is' or

a ‘this’, and in another sense it means a quality or quantity or one of the other things that are predicated as these are. While ‘being’ has all these senses, obviously that which ‘is’ primarily is the ‘what’, which indicates the substance of the thing. For when we say of what quality a thing is, we say that it is good or bad, not that it is three cubits long or that it is a man; but when we say what it is, we do not say ‘white’ or ‘hot’ or ‘three cubits long’, but ‘a man’ or ‘a ‘god’. And all other things are said to be because they are, some of them, quantities of that which is in this primary sense, others qualities of it, others affections of it, and others some other determination of it. And so one might even raise the question whether the words ‘to walk’, ‘to be healthy’, ‘to sit’ imply that each of these things is existent, and similarly in any other case of this sort; for none of them is either self-subsistent or capable of being separated from substance, but rather, if anything, it is that which walks or sits or is healthy that is an existent thing. Now these are seen to be more real because there is something definite which underlies them (i.e. the substance or individual), which is implied in such a predicate; for we never use the word ‘good’ or ‘sitting’ without implying this. Clearly then it is in virtue of this category that each of the others also is. Therefore that which is primarily, i.e. not in a qualified sense but without qualification, must be substance.

Now there are several senses in which a thing is said to be first; yet substance is first in every sense – (1) in definition, (2) in order of knowledge, (3) in time. For (3) of the other categories none can exist independently, but only substance. And (1) in definition also this is first; for in the definition of each term the definition of its substance must be present. And (2) we think we know each thing most fully, when we know what it is, e.g. what man is or what fire is, rather than when we know its quality, its quantity, or its place; since we know each of these predicates also, only when we know what the quantity or the quality is.

And indeed the question which was raised of old and is raised now and always, and is always the subject of doubt, viz. what being is, is just the question, what is substance? For it is this that some assert to be one, others more than one, and that some assert to be limited in number, others unlimited. And so we also must consider chiefly and primarily and almost exclusively what that is which is in this sense.

2

Substance is thought to belong most obviously to bodies; and so we say that not only animals and plants and their parts are substances, but also natural bodies such as fire and water and earth and everything of the sort, and all things that are either parts of these or composed of these (either of parts or of the whole bodies), e.g. the physical universe and its parts, stars and moon and sun. But whether these alone are substances, or there are also others, or only some of these, or others as well, or none of these but only some other things, are substances, must be considered. Some think the limits of body, i.e. surface, line, point, and unit, are substances, and more so than body or the solid.

Further, some do not think there is anything substantial besides sensible things, but others think there are eternal substances which are more in number and more real; e.g. Plato posited two kinds of substance – the Forms and objects of mathematics – as well as a third kind, viz. the substance of sensible bodies. And Speusippus made still more kinds of substance, beginning with the One, and assuming principles for each kind of substance, one for numbers, another for spatial magnitudes, and then another for the soul; and by going on in this way he multiplies

the kinds of substance. And some say Forms and numbers have the same nature, and the other things come after them – lines and planes – until we come to the substance of the material universe and to sensible bodies.

Regarding these matters, then, we must inquire which of the common statements are right and which are not right, and what substances there are, and whether there are or are not any besides sensible substances, and how sensible substances exist, and whether there is a substance capable of separate existence (and if so why and how) or no such substance, apart from sensible substances; and we must first sketch the nature of substance.

3

The word 'substance' is applied, if not in more senses, still at least to four main objects; for both the essence and the universal and the genus, are thought to be the substance of each thing, and fourthly the substratum. Now the substratum is that of which everything else is predicated, while it is itself not predicated of anything else. And so we must first determine the nature of this; for that which underlies a thing primarily is thought to be in the truest sense its substance. And in one sense matter is said to be of the nature of substratum, in another, shape, and in a third, the compound of these. (By the matter I mean, for instance, the bronze, by the shape the pattern of its form, and by the compound of these the statue, the concrete whole.) Therefore if the form is prior to the matter and more real, it will be prior also to the compound of both, for the same reason.

We have now outlined the nature of substance, showing that it is that which is not predicated of a stratum, but of which all else is predicated. But we must not merely state the matter thus; for this is not enough. The statement itself is obscure, and further, on this view, matter becomes substance. For if this is not substance, it baffles us to say what else is. When all else is stripped off evidently nothing but matter remains. For while the rest are affections, products, and potencies of bodies, length, breadth, and depth are quantities and not substances (for a quantity is not a substance), but the substance is rather that to which these belong primarily. But when length and breadth and depth are taken away we see nothing left unless there is something that is bounded by these; so that to those who consider the question thus matter alone must seem to be substance. By matter I mean that which in itself is neither a particular thing nor of a certain quantity nor assigned to any other of the categories by which being is determined. For there is something of which each of these is predicated, whose being is different from that of each of the predicates (for the predicates other than substance are predicated of substance, while substance is predicated of matter). Therefore the ultimate substratum is of itself neither a particular thing nor of a particular quantity nor otherwise positively characterized; nor yet is it the negations of these, for negations also will belong to it only by accident.

If we adopt this point of view, then, it follows that matter is substance. But this is impossible; for both separability and 'thisness' are thought to belong chiefly to substance. And so form and the compound of form and matter would be thought to be substance, rather than matter. The substance compounded of both, i.e. of matter and shape, may be dismissed; for it is posterior and its nature is obvious. And matter also is in a sense manifest. But we must inquire into the third kind of substance; for this is the most perplexing.

Some of the sensible substances are generally admitted to be substances, so that we must look first among these. For it is an advantage to advance to that which is more knowable. For learning proceeds for all in this way – through that which is less knowable by nature to that which is more knowable; and just as in conduct our task is to start from what is good for each and make what is without qualification good good for each, so it is our task to start from what is more knowable to oneself and make what is knowable by nature knowable to oneself. Now what is knowable and primary for particular sets of people is often knowable to a very small extent, and has little or nothing of reality. But yet one must start from that which is barely knowable but knowable to oneself, and try to know what is knowable without qualification, passing, as has been said, by way of those very things which one does know.

4

Since at the start we distinguished the various marks by which we determine substance, and one of these was thought to be the essence, we must investigate this. And first let us make some linguistic remarks about it. The essence of each thing is what it is said to be propter se. For being you is not being musical, since you are not by your very nature musical. What, then, you are by your very nature is your essence.

Nor yet is the whole of this the essence of a thing; not that which is propter se as white is to a surface, because being a surface is not identical with being white. But again the combination of both – 'being a white surface' – is not the essence of surface, because 'surface' itself is added. The formula, therefore, in which the term itself is not present but its

meaning is expressed, this is the formula of the essence of each thing. Therefore if to be a white surface is to be a smooth surface, to be white and to be smooth are one and the same.

But since there are also compounds answering to the other categories (for there is a substratum for each category, e.g. for quality, quantity, time, place, and motion), we must inquire whether there is a formula of the essence of each of them, i.e. whether to these compounds also there belongs an essence, e.g. 'white man'. Let the compound be denoted by 'cloak'. What is the essence of cloak? But, it may be said, this also is not a propter se expression. We reply that there are just two ways in which a predicate may fail to be true of a subject propter se, and one of these results from the addition, and the other from the omission, of a determinant. One kind of predicate is not propter se because the term that is being defined is combined with another determinant, e.g. if in defining the essence of white one were to state the formula of white man; the other because in the subject another determinant is combined with that which is expressed in the formula, e.g. if 'cloak' meant 'white man', and one were to define cloak as white; white man is white indeed, but its essence is not to be white.

But is being-a-cloak an essence at all? Probably not. For the essence is precisely what something is; but when an attribute is asserted of a subject other than itself, the complex is not precisely what some 'this' is, e.g. white man is not precisely what some 'this' is, since thisness belongs only to substances. Therefore there is an essence only of those things whose formula is a definition. But we have a definition not where we have a word and a formula identical in meaning (for in that case all formulae or sets of words would be definitions; for there will be some name for any set of words whatever, so that even the Iliad will be a definition), but where there is a formula of something primary; and primary things are those which do not

imply the predication of one element in them of another element. Nothing, then, which is not a species of a genus will have an essence – only species will have it, for these are thought to imply not merely that the subject participates in the attribute and has it as an affection, or has it by accident; but for ever thing else as well, if it has a name, there be a formula of its meaning – viz. that this attribute belongs to this subject; or instead of a simple formula we shall be able to give a more accurate one; but there will be no definition nor essence.

Or has 'definition', like 'what a thing is', several meanings? 'What a thing is' in one sense means substance and the 'this', in another one or other of the predicates, quantity, quality, and the like. For as 'is' belongs to all things, not however in the same sense, but to one sort of thing primarily and to others in a secondary way, so too 'what a thing is' belongs in the simple sense to substance, but in a limited sense to the other categories. For even of a quality we might ask what it is, so that quality also is a 'what a thing is', – not in the simple sense, however, but just as, in the case of that which is not, some say, emphasizing the linguistic form, that that is which is not is-not is simply, but is non-existent; so too with quality.

We must no doubt inquire how we should express ourselves on each point, but certainly not more than how the facts actually stand. And so now also, since it is evident what language we use, essence will belong, just as 'what a thing is' does, primarily and in the simple sense to substance, and in a secondary way to the other categories also, – not essence in the simple sense, but the essence of a quality or of a quantity. For it must be either by an equivocation that we say these are, or by adding to and taking from the meaning of 'are' (in the way in which that which is not known may be said to be known), – the truth being that we use the word neither ambiguously nor in the same sense, but just as we apply the word 'medical' by virtue of a

reference to one and the same thing, not meaning one and the same thing, nor yet speaking ambiguously; for a patient and an operation and an instrument are called medical neither by an ambiguity nor with a single meaning, but with reference to a common end. But it does not matter at all in which of the two ways one likes to describe the facts; this is evident, that definition and essence in the primary and simple sense belong to substances. Still they belong to other things as well, only not in the primary sense. For if we suppose this it does not follow that there is a definition of every word which means the same as any formula; it must mean the same as a particular kind of formula; and this condition is satisfied if it is a formula of something which is one, not by continuity like the Iliad or the things that are one by being bound together, but in one of the main senses of 'one', which answer to the senses of 'is'; now 'that which is' in one sense denotes a 'this', in another a quantity, in another a quality. And so there can be a formula or definition even of white man, but not in the sense in which there is a definition either of white or of a substance.

5

It is a difficult question, if one denies that a formula with an added determinant is a definition, whether any of the terms that are not simple but coupled will be definable. For we must explain them by adding a determinant. E.g. there is the nose, and concavity, and snubness, which is compounded out of the two by the presence of the one in the other, and it is not by accident that the nose has the attribute either of concavity or of snubness, but in virtue of its nature; nor do they attach to it as whiteness does to Callias, or to man (because Callias, who happens to be a man, is white), but as 'male' attaches to animal

and ‘equal’ to quantity, and as all so-called ‘attributes propter se’ attach to their subjects. And such attributes are those in which is involved either the formula or the name of the subject of the particular attribute, and which cannot be explained without this; e.g. white can be explained apart from man, but not female apart from animal. Therefore there is either no essence and definition of any of these things, or if there is, it is in another sense, as we have said.

But there is also a second difficulty about them. For if snub nose and concave nose are the same thing, snub and concave will be the thing; but if snub and concave are not the same (because it is impossible to speak of snubness apart from the thing of which it is an attribute propter se, for snubness is concavity-in-a-nose), either it is impossible to say ‘snub nose’ or the same thing will have been said twice, concave-nose nose; for snub nose will be concave-nose nose. And so it is absurd that such things should have an essence; if they have, there will be an infinite regress; for in snub-nose nose yet another ‘nose’ will be involved.

Clearly, then, only substance is definable. For if the other categories also are definable, it must be by addition of a determinant, e.g. the qualitative is defined thus, and so is the odd, for it cannot be defined apart from number; nor can female be defined apart from animal. (When I say ‘by addition’ I mean the expressions in which it turns out that we are saying the same thing twice, as in these instances.) And if this is true, coupled terms also, like ‘odd number’, will not be definable (but this escapes our notice because our formulae are not accurate.). But if these also are definable, either it is in some other way or, as we definition and essence must be said to have more than one sense. Therefore in one sense nothing will have a definition and nothing will have an essence, except substances, but in another sense other things will have them. Clearly, then,

definition is the formula of the essence, and essence belongs to substances either alone or chiefly and primarily and in the unqualified sense.

6

We must inquire whether each thing and its essence are the same or different. This is of some use for the inquiry concerning substance; for each thing is thought to be not different from its substance, and the essence is said to be the substance of each thing.

Now in the case of accidental unities the two would be generally thought to be different, e.g. white man would be thought to be different from the essence of white man. For if they are the same, the essence of man and that of white man are also the same; for a man and a white man are the same thing, as people say, so that the essence of white man and that of man would be also the same. But perhaps it does not follow that the essence of accidental unities should be the same as that of the simple terms. For the extreme terms are not in the same way identical with the middle term. But perhaps this might be thought to follow, that the extreme terms, the accidents, should turn out to be the same, e.g. the essence of white and that of musical; but this is not actually thought to be the case.

But in the case of so-called self-subsistent things, is a thing necessarily the same as its essence? E.g. if there are some substances which have no other substances nor entities prior to them – substances such as some assert the Ideas to be? – If the essence of good is to be different from good-itself, and the essence of animal from animal-itself, and the essence of being

from being-itself, there will, firstly, be other substances and entities and Ideas besides those which are asserted, and, secondly, these others will be prior substances, if essence is substance. And if the posterior substances and the prior are severed from each other, (a) there will be no knowledge of the former, and (b) the latter will have no being. (By 'severed' I mean, if the good-itself has not the essence of good, and the latter has not the property of being good.) For (a) there is knowledge of each thing only when we know its essence. And (b) the case is the same for other things as for the good; so that if the essence of good is not good, neither is the essence of reality real, nor the essence of unity one. And all essences alike exist or none of them does; so that if the essence of reality is not real, neither is any of the others. Again, that to which the essence of good does not belong is not good. – The good, then, must be one with the essence of good, and the beautiful with the essence of beauty, and so with all things which do not depend on something else but are self-subsistent and primary. For it is enough if they are this, even if they are not Forms; or rather, perhaps, even if they are Forms. (At the same time it is clear that if there are Ideas such as some people say there are, it will not be substratum that is substance; for these must be substances, but not predicable of a substratum; for if they were they would exist only by being participated in.)

Each thing itself, then, and its essence are one and the same in no merely accidental way, as is evident both from the preceding arguments and because to know each thing, at least, is just to know its essence, so that even by the exhibition of instances it becomes clear that both must be one.

(But of an accidental term, e.g.'the musical' or 'the white', since it has two meanings, it is not true to say that it itself is identical with its essence; for both that to which the accidental quality belongs, and the accidental quality, are white, so that in a sense

the accident and its essence are the same, and in a sense they are not; for the essence of white is not the same as the man or the white man, but it is the same as the attribute white.)

The absurdity of the separation would appear also if one were to assign a name to each of the essences; for there would be yet another essence besides the original one, e.g. to the essence of horse there will belong a second essence. Yet why should not some things be their essences from the start, since essence is substance? But indeed not only are a thing and its essence one, but the formula of them is also the same, as is clear even from what has been said; for it is not by accident that the essence of one, and the one, are one. Further, if they are to be different, the process will go on to infinity; for we shall have (1) the essence of one, and (2) the one, so that to terms of the former kind the same argument will be applicable.

Clearly, then, each primary and self-subsistent thing is one and the same as its essence. The sophistical objections to this position, and the question whether Socrates and to be Socrates are the same thing, are obviously answered by the same solution; for there is no difference either in the standpoint from which the question would be asked, or in that from which one could answer it successfully. We have explained, then, in what sense each thing is the same as its essence and in what sense it is not.

7

Of things that come to be, some come to be by nature, some by art, some spontaneously. Now everything that comes to be comes to be by the agency of something and from something and comes to be something. And the something which I say it

comes to be may be found in any category; it may come to be either a ‘this’ or of some size or of some quality or somewhere.

Now natural comings to be are the comings to be of those things which come to be by nature; and that out of which they come to be is what we call matter; and that by which they come to be is something which exists naturally; and the something which they come to be is a man or a plant or one of the things of this kind, which we say are substances if anything is – all things produced either by nature or by art have matter; for each of them is capable both of being and of not being, and this capacity is the matter in each – and, in general, both that from which they are produced is nature, and the type according to which they are produced is nature (for that which is produced, e.g. a plant or an animal, has a nature), and so is that by which they are produced – the so-called ‘formal’ nature, which is specifically the same (though this is in another individual); for man begets man.

Thus, then, are natural products produced; all other productions are called ‘makings’. And all makings proceed either from art or from a faculty or from thought. Some of them happen also spontaneously or by luck just as natural products sometimes do; for there also the same things sometimes are produced without seed as well as from seed. Concerning these cases, then, we must inquire later, but from art proceed the things of which the form is in the soul of the artist. (By form I mean the essence of each thing and its primary substance.) For even contraries have in a sense the same form; for the substance of a privation is the opposite substance, e.g. health is the substance of disease (for disease is the absence of health); and health is the formula in the soul or the knowledge of it. The healthy subject is produced as the result of the following train of thought: – since this is health, if the subject is to be healthy this must first be present, e.g. a uniform state of body, and if this is

to be present, there must be heat; and the physician goes on thinking thus until he reduces the matter to a final something which he himself can produce. Then the process from this point onward, i.e. the process towards health, is called a 'making'. Therefore it follows that in a sense health comes from health and house from house, that with matter from that without matter; for the medical art and the building art are the form of health and of the house, and when I speak of substance without matter I mean the essence.

Of the productions or processes one part is called thinking and the other making, – that which proceeds from the starting-point and the form is thinking, and that which proceeds from the final step of the thinking is making. And each of the other, intermediate, things is produced in the same way. I mean, for instance, if the subject is to be healthy his bodily state must be made uniform. What then does being made uniform imply? This or that. And this depends on his being made warm. What does this imply? Something else. And this something is present potentially; and what is present potentially is already in the physician's power.

The active principle then and the starting point for the process of becoming healthy is, if it happens by art, the form in the soul, and if spontaneously, it is that, whatever it is, which starts the making, for the man who makes by art, as in healing the starting-point is perhaps the production of warmth (and this the physician produces by rubbing). Warmth in the body, then, is either a part of health or is followed (either directly or through several intermediate steps) by something similar which is a part of health; and this, viz. that which produces the part of health, is the limiting-point – and so too with a house (the stones are the limiting-point here) and in all other cases. Therefore, as the saying goes, it is impossible that anything should be produced if there were nothing existing before. Obviously then some part of

the result will pre-exist of necessity; for the matter is a part; for this is present in the process and it is this that becomes something. But is the matter an element even in the formula? We certainly describe in both ways what brazen circles are; we describe both the matter by saying it is brass, and the form by saying that it is such and such a figure; and figure is the proximate genus in which it is placed. The brazen circle, then, has its matter in its formula.

As for that out of which as matter they are produced, some things are said, when they have been produced, to be not that but 'thaten'; e.g. the statue is not gold but golden. And a healthy man is not said to be that from which he has come. The reason is that though a thing comes both from its privation and from its substratum, which we call its matter (e.g. what becomes healthy is both a man and an invalid), it is said to come rather from its privation (e.g. it is from an invalid rather than from a man that a healthy subject is produced). And so the healthy subject is not said to he an invalid, but to be a man, and the man is said to be healthy. But as for the things whose privation is obscure and nameless, e.g. in brass the privation of a particular shape or in bricks and timber the privation of arrangement as a house, the thing is thought to be produced from these materials, as in the former case the healthy man is produced from an invalid. And so, as there also a thing is not said to be that from which it comes, here the statue is not said to be wood but is said by a verbal change to be wooden, not brass but brazen, not gold but golden, and the house is said to be not bricks but bricken (though we should not say without qualification, if we looked at the matter carefully, even that a statue is produced from wood or a house from bricks, because coming to be implies change in that from which a thing comes to be, and not permanence). It is for this reason, then, that we use this way of speaking.

8

Since anything which is produced is produced by something (and this I call the starting-point of the production), and from something (and let this be taken to be not the privation but the matter; for the meaning we attach to this has already been explained), and since something is produced (and this is either a sphere or a circle or whatever else it may chance to be), just as we do not make the substratum (the brass), so we do not make the sphere, except incidentally, because the brazen sphere is a sphere and we make the forme. For to make a 'this' is to make a 'this' out of the substratum in the full sense of the word. (I mean that to make the brass round is not to make the round or the sphere, but something else, i.e. to produce this form in something different from itself. For if we make the form, we must make it out of something else; for this was assumed. E.g. we make a brazen sphere; and that in the sense that out of this, which is brass, we make this other, which is a sphere.) If, then, we also make the substratum itself, clearly we shall make it in the same way, and the processes of making will regress to infinity. Obviously then the form also, or whatever we ought to call the shape present in the sensible thing, is not produced, nor is there any production of it, nor is the essence produced; for this is that which is made to be in something else either by art or by nature or by some faculty. But that there is a brazen sphere, this we make. For we make it out of brass and the sphere; we bring the form into this particular matter, and the result is a brazen sphere. But if the essence of sphere in general is to be produced, something must be produced out of something. For the product will always have to be divisible, and one part must be this and another that; I mean the one must be

matter and the other form. If, then, a sphere is 'the figure whose circumference is at all points equidistant from the centre', part of this will be the medium in which the thing made will be, and part will be in that medium, and the whole will be the thing produced, which corresponds to the brazen sphere. It is obvious, then, from what has been said, that that which is spoken of as form or substance is not produced, but the concrete thing which gets its name from this is produced, and that in everything which is generated matter is present, and one part of the thing is matter and the other form.

Is there, then, a sphere apart from the individual spheres or a house apart from the bricks? Rather we may say that no 'this' would ever have been coming to be, if this had been so, but that the 'form' means the 'such', and is not a 'this' – a definite thing; but the artist makes, or the father begets, a 'such' out of a 'this'; and when it has been begotten, it is a 'this such'. And the whole 'this', Callias or Socrates, is analogous to 'this brazen sphere', but man and animal to 'brazen sphere' in general. Obviously, then, the cause which consists of the Forms (taken in the sense in which some maintain the existence of the Forms, i.e. if they are something apart from the individuals) is useless, at least with regard to comings-to-be and to substances; and the Forms need not, for this reason at least, be self-subsistent substances. In some cases indeed it is even obvious that the begetter is of the same kind as the begotten (not, however, the same nor one in number, but in form), i.e. in the case of natural products (for man begets man), unless something happens contrary to nature, e.g. the production of a mule by a horse. (And even these cases are similar; for that which would be found to be common to horse and ass, the genus next above them, has not received a name, but it would doubtless be both in fact something like a mule.) Obviously, therefore, it is quite unnecessary to set up a Form as a pattern (for we should have looked for Forms in these cases if in any; for these are substances if anything is so); the

begetter is adequate to the making of the product and to the causing of the form in the matter. And when we have the whole, such and such a form in this flesh and in these bones, this is Callias or Socrates; and they are different in virtue of their matter (for that is different), but the same in form; for their form is indivisible.

9

The question might be raised, why some things are produced spontaneously as well as by art, e.g. health, while others are not, e.g. a house. The reason is that in some cases the matter which governs the production in the making and producing of any work of art, and in which a part of the product is present, – some matter is such as to be set in motion by itself and some is not of this nature, and of the former kind some can move itself in the particular way required, while other matter is incapable of this; for many things can be set in motion by themselves but not in some particular way, e.g. that of dancing. The things, then, whose matter is of this sort, e.g. stones, cannot be moved in the particular way required, except by something else, but in another way they can move themselves – and so it is with fire. Therefore some things will not exist apart from some one who has the art of making them, while others will; for motion will be started by these things which have not the art but can themselves be moved by other things which have not the art or with a motion starting from a part of the product.

And it is clear also from what has been said that in a sense every product of art is produced from a thing which shares its name (as natural products are produced), or from a part of itself which shares its name (e.g. the house is produced from a house,

qua produced by reason; for the art of building is the form of the house), or from something which contains a art of it, – if we exclude things produced by accident; for the cause of the thing's producing the product directly per se is a part of the product. The heat in the movement caused heat in the body, and this is either health, or a part of health, or is followed by a part of health or by health itself. And so it is said to cause health, because it causes that to which health attaches as a consequence.

Therefore, as in syllogisms, substance is the starting-point of everything. It is from 'what a thing is' that syllogisms start; and from it also we now find processes of production to start.

Things which are formed by nature are in the same case as these products of art. For the seed is productive in the same way as the things that work by art; for it has the form potentially, and that from which the seed comes has in a sense the same name as the offspring only in a sense, for we must not expect parent and offspring always to have exactly the same name, as in the production of 'human being' from 'human' for a 'woman' also can be produced by a 'man' – unless the offspring be an imperfect form; which is the reason why the parent of a mule is not a mule. The natural things which (like the artificial objects previously considered) can be produced spontaneously are those whose matter can be moved even by itself in the way in which the seed usually moves it; those things which have not such matter cannot be produced except from the parent animals themselves.

But not only regarding substance does our argument prove that its form does not come to be, but the argument applies to all the primary classes alike, i.e. quantity, quality, and the other categories. For as the brazen sphere comes to be, but not the sphere nor the brass, and so too in the case of brass itself, if it

comes to be, it is its concrete unity that comes to be (for the matter and the form must always exist before), so is it both in the case of substance and in that of quality and quantity and the other categories likewise; for the quality does not come to be, but the wood of that quality, and the quantity does not come to be, but the wood or the animal of that size. But we may learn from these instances a peculiarity of substance, that there must exist beforehand in complete reality another substance which produces it, e.g. an animal if an animal is produced; but it is not necessary that a quality or quantity should pre-exist otherwise than potentially.

10

Since a definition is a formula, and every formula has parts, and as the formula is to the thing, so is the part of the formula to the part of the thing, the question is already being asked whether the formula of the parts must be present in the formula of the whole or not. For in some cases the formulae of the parts are seen to be present, and in some not. The formula of the circle does not include that of the segments, but that of the syllable includes that of the letters; yet the circle is divided into segments as the syllable is into letters. – And further if the parts are prior to the whole, and the acute angle is a part of the right angle and the finger a part of the animal, the acute angle will be prior to the right angle and finger to the man. But the latter are thought to be prior; for in formula the parts are explained by reference to them, and in respect also of the power of existing apart from each other the wholes are prior to the parts.

Perhaps we should rather say that ‘part’ is used in several senses. One of these is ‘that which measures another thing in respect of quantity’. But let this sense be set aside; let us inquire about the parts of which substance consists. If then matter is one thing, form another, the compound of these a third, and both the matter and the form and the compound are substance even the matter is in a sense called part of a thing, while in a sense it is not, but only the elements of which the formula of the form consists. E.g. of concavity flesh (for this is the matter in which it is produced) is not a part, but of snubness it is a part; and the bronze is a part of the concrete statue, but not of the statue when this is spoken of in the sense of the form. (For the form, or the thing as having form, should be said to be the thing, but the material element by itself must never be said to be so.) And so the formula of the circle does not include that of the segments, but the formula of the syllable includes that of the letters; for the letters are parts of the formula of the form, and not matter, but the segments are parts in the sense of matter on which the form supervenes; yet they are nearer the form than the bronze is when roundness is produced in bronze. But in a sense not even every kind of letter will be present in the formula of the syllable, e.g. particular waxen letters or the letters as movements in the air; for in these also we have already something that is part of the syllable only in the sense that it is its perceptible matter. For even if the line when divided passes away into its halves, or the man into bones and muscles and flesh, it does not follow that they are composed of these as parts of their essence, but rather as matter; and these are parts of the concrete thing, but not also of the form, i.e. of that to which the formula refers; wherefore also they are not present in the formulae. In one kind of formula, then, the formula of such parts will be present, but in another it must not be present, where the formula does not refer to the concrete object. For it is for this reason that some things have as their constituent

principles parts into which they pass away, while some have not. Those things which are the form and the matter taken together, e.g. the snub, or the bronze circle, pass away into these materials, and the matter is a part of them; but those things which do not involve matter but are without matter, and whose formulae are formulae of the form only, do not pass away, – either not at all or at any rate not in this way. Therefore these materials are principles and parts of the concrete things, while of the form they are neither parts nor principles. And therefore the clay statue is resolved into clay and the ball into bronze and Callias into flesh and bones, and again the circle into its segments; for there is a sense of 'circle' in which involves matter. For 'circle' is used ambiguously, meaning both the circle, unqualified, and the individual circle, because there is no name peculiar to the individuals.

The truth has indeed now been stated, but still let us state it yet more clearly, taking up the question again. The parts of the formula, into which the formula is divided, are prior to it, either all or some of them. The formula of the right angle, however, does not include the formula of the acute, but the formula of the acute includes that of the right angle; for he who defines the acute uses the right angle; for the acute is 'less than a right angle'. The circle and the semicircle also are in a like relation; for the semicircle is defined by the circle; and so is the finger by the whole body, for a finger is 'such and such a part of a man'. Therefore the parts which are of the nature of matter, and into which as its matter a thing is divided, are posterior; but those which are of the nature of parts of the formula, and of the substance according to its formula, are prior, either all or some of them. And since the soul of animals (for this is the substance of a living being) is their substance according to the formula, i.e. the form and the essence of a body of a certain kind (at least we shall define each part, if we define it well, not without reference to its function, and this cannot belong to it without perception),

so that the parts of soul are prior, either all or some of them, to the concrete 'animal', and so too with each individual animal; and the body and parts are posterior to this, the essential substance, and it is not the substance but the concrete thing that is divided into these parts as its matter: – this being so, to the concrete thing these are in a sense prior, but in a sense they are not. For they cannot even exist if severed from the whole; for it is not a finger in any and every state that is the finger of a living thing, but a dead finger is a finger only in name. Some parts are neither prior nor posterior to the whole, i.e. those which are dominant and in which the formula, i.e. the essential substance, is immediately present, e.g. perhaps the heart or the brain; for it does not matter in the least which of the two has this quality. But man and horse and terms which are thus applied to individuals, but universally, are not substance but something composed of this particular formula and this particular matter treated as universal; and as regards the individual, Socrates already includes in him ultimate individual matter; and similarly in all other cases. 'A part' may be a part either of the form (i.e. of the essence), or of the compound of the form and the matter, or of the matter itself. But only the parts of the form are parts of the formula, and the formula is of the universal; for 'being a circle' is the same as the circle, and 'being a soul' the same as the soul. But when we come to the concrete thing, e.g. this circle, i.e. one of the individual circles, whether perceptible or intelligible (I mean by intelligible circles the mathematical, and by perceptible circles those of bronze and of wood), – of these there is no definition, but they are known by the aid of intuitive thinking or of perception; and when they pass out of this complete realization it is not clear whether they exist or not; but they are always stated and recognized by means of the universal formula. But matter is unknowable in itself. And some matter is perceptible and some intelligible, perceptible matter being for instance bronze and

wood and all matter that is changeable, and intelligible matter being that which is present in perceptible things not qua perceptible, i.e. the objects of mathematics.

We have stated, then, how matters stand with regard to whole and part, and their priority and posteriority. But when any one asks whether the right angle and the circle and the animal are prior, or the things into which they are divided and of which they consist, i.e. the parts, we must meet the inquiry by saying that the question cannot be answered simply. For if even bare soul is the animal or the living thing, or the soul of each individual is the individual itself, and 'being a circle' is the circle, and 'being a right angle' and the essence of the right angle is the right angle, then the whole in one sense must be called posterior to the art in one sense, i.e. to the parts included in the formula and to the parts of the individual right angle (for both the material right angle which is made of bronze, and that which is formed by individual lines, are posterior to their parts); while the immaterial right angle is posterior to the parts included in the formula, but prior to those included in the particular instance, and the question must not be answered simply. If, however, the soul is something different and is not identical with the animal, even so some parts must, as we have maintained, be called prior and others must not.

11

Another question is naturally raised, viz. what sort of parts belong to the form and what sort not to the form, but to the concrete thing. Yet if this is not plain it is not possible to define any thing; for definition is of the universal and of the form. If then it is not evident what sort of parts are of the nature of

matter and what sort are not, neither will the formula of the thing be evident. In the case of things which are found to occur in specifically different materials, as a circle may exist in bronze or stone or wood, it seems plain that these, the bronze or the stone, are no part of the essence of the circle, since it is found apart from them. Of things which are not seen to exist apart, there is no reason why the same may not be true, just as if all circles that had ever been seen were of bronze; for none the less the bronze would be no part of the form; but it is hard to eliminate it in thought. E.g. the form of man is always found in flesh and bones and parts of this kind; are these then also parts of the form and the formula? No, they are matter; but because man is not found also in other matters we are unable to perform the abstraction.

Since this is thought to be possible, but it is not clear when it is the case, some people already raise the question even in the case of the circle and the triangle, thinking that it is not right to define these by reference to lines and to the continuous, but that all these are to the circle or the triangle as flesh and bones are to man, and bronze or stone to the statue; and they reduce all things to numbers, and they say the formula of 'line' is that of 'two'. And of those who assert the Ideas some make 'two' the line-itself, and others make it the Form of the line; for in some cases they say the Form and that of which it is the Form are the same, e.g. 'two' and the Form of two; but in the case of 'line' they say this is no longer so.

It follows then that there is one Form for many things whose form is evidently different (a conclusion which confronted the Pythagoreans also); and it is possible to make one thing the Form-itself of all, and to hold that the others are not Forms; but thus all things will be one.

We have pointed out, then, that the question of definitions contains some difficulty, and why this is so. And so to reduce all things thus to Forms and to eliminate the matter is useless labour; for some things surely are a particular form in a particular matter, or particular things in a particular state. And the comparison which Socrates the younger used to make in the case of 'animal' is not sound; for it leads away from the truth, and makes one suppose that man can possibly exist without his parts, as the circle can without the bronze. But the case is not similar; for an animal is something perceptible, and it is not possible to define it without reference to movement – nor, therefore, without reference to the parts' being in a certain state. For it is not a hand in any and every state that is a part of man, but only when it can fulfil its work, and therefore only when it is alive; if it is not alive it is not a part.

Regarding the objects of mathematics, why are the formulae of the parts not parts of the formulae of the wholes; e.g. why are not the semicircles included in the formula of the circle? It cannot be said, 'because these parts are perceptible things'; for they are not. But perhaps this makes no difference; for even some things which are not perceptible must have matter; indeed there is some matter in everything which is not an essence and a bare form but a 'this'. The semicircles, then, will not be parts of the universal circle, but will be parts of the individual circles, as has been said before; for while one kind of matter is perceptible, there is another which is intelligible.

It is clear also that the soul is the primary substance and the body is matter, and man or animal is the compound of both taken universally; and 'Socrates' or 'Coriscus', if even the soul of Socrates may be called Socrates, has two meanings (for some mean by such a term the soul, and others mean the concrete thing), but if 'Socrates' or 'Coriscus' means simply this

particular soul and this particular body, the individual is analogous to the universal in its composition.

Whether there is, apart from the matter of such substances, another kind of matter, and one should look for some substance other than these, e.g. numbers or something of the sort, must be considered later. For it is for the sake of this that we are trying to determine the nature of perceptible substances as well, since in a sense the inquiry about perceptible substances is the work of physics, i.e. of second philosophy; for the physicist must come to know not only about the matter, but also about the substance expressed in the formula, and even more than about the other. And in the case of definitions, how the elements in the formula are parts of the definition, and why the definition is one formula (for clearly the thing is one, but in virtue of what is the thing one, although it has parts?), – this must be considered later.

What the essence is and in what sense it is independent, has been stated universally in a way which is true of every case, and also why the formula of the essence of some things contains the parts of the thing defined, while that of others does not. And we have stated that in the formula of the substance the material parts will not be present (for they are not even parts of the substance in that sense, but of the concrete substance; but of this there is in a sense a formula, and in a sense there is not; for there is no formula of it with its matter, for this is indefinite, but there is a formula of it with reference to its primary substance – e.g. in the case of man the formula of the soul – , for the substance is the indwelling form, from which and the matter the so-called concrete substance is derived; e.g. concavity is a form of this sort, for from this and the nose arise 'snub nose' and 'snubness'); but in the concrete substance, e.g. a snub nose or Callias, the matter also will be present. And we have stated that the essence and the thing itself are in some

cases the same; ie. in the case of primary substances, e.g. curvature and the essence of curvature if this is primary. (By a 'primary' substance I mean one which does not imply the presence of something in something else, i.e. in something that underlies it which acts as matter.) But things which are of the nature of matter, or of wholes that include matter, are not the same as their essences, nor are accidental unities like that of 'Socrates' and 'musical'; for these are the same only by accident.

12

Now let us treat first of definition, in so far as we have not treated of it in the Analytics; for the problem stated in them is useful for our inquiries concerning substance. I mean this problem: – wherein can consist the unity of that, the formula of which we call a definition, as for instance, in the case of man, 'two-footed animal'; for let this be the formula of man. Why, then, is this one, and not many, viz. 'animal' and 'two-footed'? For in the case of 'man' and 'pale' there is a plurality when one term does not belong to the other, but a unity when it does belong and the subject, man, has a certain attribute; for then a unity is produced and we have 'the pale man'. In the present case, on the other hand, one does not share in the other; the genus is not thought to share in its differentiae (for then the same thing would share in contraries; for the differentiae by which the genus is divided are contrary). And even if the genus does share in them, the same argument applies, since the differentiae present in man are many, e.g. endowed with feet, two-footed, featherless. Why are these one and not many? Not because they are present in one thing; for on this principle a unity can be made out of all the attributes of a thing. But surely all the attributes in the definition must be one; for the

definition is a single formula and a formula of substance, so that it must be a formula of some one thing; for substance means a 'one' and a 'this', as we maintain.

We must first inquire about definitions reached by the method of divisions. There is nothing in the definition except the first-named and the differentiae. The other genera are the first genus and along with this the differentiae that are taken with it, e.g. the first may be 'animal', the next 'animal which is two-footed', and again 'animal which is two-footed and featherless', and similarly if the definition includes more terms. And in general it makes no difference whether it includes many or few terms, – nor, therefore, whether it includes few or simply two; and of the two the one is differentia and the other genus; e.g. in 'two-footed animal' 'animal' is genus, and the other is differentia.

If then the genus absolutely does not exist apart from the species-of-a-genus, or if it exists but exists as matter (for the voice is genus and matter, but its differentiae make the species, i.e. the letters, out of it), clearly the definition is the formula which comprises the differentiae.

But it is also necessary that the division be by the differentia of the diferentia; e.g. 'endowed with feet' is a differentia of 'animal'; again the differentia of 'animal endowed with feet' must be of it qua endowed with feet. Therefore we must not say, if we are to speak rightly, that of that which is endowed with feet one part has feathers and one is featherless (if we do this we do it through incapacity); we must divide it only into cloven-footed and not cloven; for these are differentiae in the foot; cloven-footedness is a form of footedness. And the process wants always to go on so till it reaches the species that contain no differences. And then there will be as many kinds of foot as there are differentiae, and the kinds of animals endowed with feet will be equal in number to the differentiae. If then this is so,

clearly the last differentia will be the substance of the thing and its definition, since it is not right to state the same things more than once in our definitions; for it is superfluous. And this does happen; for when we say 'animal endowed with feet and two-footed' we have said nothing other than 'animal having feet, having two feet'; and if we divide this by the proper division, we shall be saying the same thing more than once – as many times as there are differentiae.

If then a differentia of a differentia be taken at each step, one differentia – the last – will be the form and the substance; but if we divide according to accidental qualities, e.g. if we were to divide that which is endowed with feet into the white and the black, there will be as many differentiae as there are cuts. Therefore it is plain that the definition is the formula which contains the differentiae, or, according to the right method, the last of these. This would be evident, if we were to change the order of such definitions, e.g. of that of man, saying 'animal which is two-footed and endowed with feet'; for 'endowed with feet' is superfluous when 'two-footed' has been said. But there is no order in the substance; for how are we to think the one element posterior and the other prior? Regarding the definitions, then, which are reached by the method of divisions, let this suffice as our first attempt at stating their nature.

13

Let us return to the subject of our inquiry, which is substance. As the substratum and the essence and the compound of these are called substance, so also is the universal. About two of these we have spoken; both about the essence and about the substratum, of which we have said that it underlies in two

senses, either being a 'this' – which is the way in which an animal underlies its attributes – or as the matter underlies the complete reality. The universal also is thought by some to be in the fullest sense a cause, and a principle; therefore let us attack the discussion of this point also. For it seems impossible that any universal term should be the name of a substance. For firstly the substance of each thing is that which is peculiar to it, which does not belong to anything else; but the universal is common, since that is called universal which is such as to belong to more than one thing. Of which individual then will this be the substance? Either of all or of none; but it cannot be the substance of all. And if it is to be the substance of one, this one will be the others also; for things whose substance is one and whose essence is one are themselves also one.

Further, substance means that which is not predicable of a subject, but the universal is predicable of some subject always.

But perhaps the universal, while it cannot be substance in the way in which the essence is so, can be present in this; e.g. 'animal' can be present in 'man' and 'horse'. Then clearly it is a formula of the essence. And it makes no difference even if it is not a formula of everything that is in the substance; for none the less the universal will be the substance of something, as 'man' is the substance of the individual man in whom it is present, so that the same result will follow once more; for the universal, e.g. 'animal', will be the substance of that in which it is present as something peculiar to it. And further it is impossible and absurd that the 'this', i.e. the substance, if it consists of parts, should not consist of substances nor of what is a 'this', but of quality; for that which is not substance, i.e. the quality, will then be prior to substance and to the 'this'. Which is impossible; for neither in formula nor in time nor in coming to be can the modifications be prior to the substance; for then they will also be separable from it. Further, Socrates will contain a

substance present in a substance, so that this will be the substance of two things. And in general it follows, if man and such things are substance, that none of the elements in their formulae is the substance of anything, nor does it exist apart from the species or in anything else; I mean, for instance, that no 'animal' exists apart from the particular kinds of animal, nor does any other of the elements present in formulae exist apart.

If, then, we view the matter from these standpoints, it is plain that no universal attribute is a substance, and this is plain also from the fact that no common predicate indicates a 'this', but rather a 'such'. If not, many difficulties follow and especially the 'third man'.

The conclusion is evident also from the following consideration. A substance cannot consist of substances present in it in complete reality; for things that are thus in complete reality two are never in complete reality one, though if they are potentially two, they can be one (e.g. the double line consists of two halves – potentially; for the complete realization of the halves divides them from one another); therefore if the substance is one, it will not consist of substances present in it and present in this way, which Democritus describes rightly; he says one thing cannot be made out of two nor two out of one; for he identifies substances with his indivisible magnitudes. It is clear therefore that the same will hold good of number, if number is a synthesis of units, as is said by some; for two is either not one, or there is no unit present in it in complete reality. But our result involves a difficulty. If no substance can consist of universals because a universal indicates a 'such', not a 'this', and if no substance can be composed of substances existing in complete reality, every substance would be incomposite, so that there would not even be a formula of any substance. But it is thought by all and was stated long ago that it is either only, or primarily, substance that can defined; yet now it seems that not even substance can.

There cannot, then, be a definition of anything; or in a sense there can be, and in a sense there cannot. And what we are saying will be plainer from what follows.

14

It is clear also from these very facts what consequence confronts those who say the Ideas are substances capable of separate existence, and at the same time make the Form consist of the genus and the differentiae. For if the Forms exist and 'animal' is present in 'man' and 'horse', it is either one and the same in number, or different. (In formula it is clearly one; for he who states the formula will go through the formula in either case.) If then there is a 'man-in-himself' who is a 'this' and exists apart, the parts also of which he consists, e.g. 'animal' and 'two-footed', must indicate 'thises', and be capable of separate existence, and substances; therefore 'animal', as well as 'man', must be of this sort.

Now (1) if the 'animal' in 'the horse' and in 'man' is one and the same, as you are with yourself, (a) how will the one in things that exist apart be one, and how will this 'animal' escape being divided even from itself?

Further, (b) if it is to share in 'two-footed' and 'many-footed', an impossible conclusion follows; for contrary attributes will belong at the same time to it although it is one and a 'this'. If it is not to share in them, what is the relation implied when one says the animal is two-footed or possessed of feet? But perhaps the two things are 'put together' and are 'in contact', or are 'mixed'. Yet all these expressions are absurd.

But (2) suppose the Form to be different in each species. Then there will be practically an infinite number of things whose substance is animal'; for it is not by accident that 'man' has 'animal' for one of its elements. Further, many things will be 'animal-itself'. For (i) the 'animal' in each species will be the substance of the species; for it is after nothing else that the species is called; if it were, that other would be an element in 'man', i.e. would be the genus of man. And further, (ii) all the elements of which 'man' is composed will be Ideas. None of them, then, will be the Idea of one thing and the substance of another; this is impossible. The 'animal', then, present in each species of animals will be animal-itself. Further, from what is this 'animal' in each species derived, and how will it be derived from animal-itself? Or how can this 'animal', whose essence is simply animality, exist apart from animal-itself?

Further, (3)in the case of sensible things both these consequences and others still more absurd follow. If, then, these consequences are impossible, clearly there are not Forms of sensible things in the sense in which some maintain their existence.

15

Since substance is of two kinds, the concrete thing and the formula (I mean that one kind of substance is the formula taken with the matter, while another kind is the formula in its generality), substances in the former sense are capable of destruction (for they are capable also of generation), but there is no destruction of the formula in the sense that it is ever in course of being destroyed (for there is no generation of it either; the being of house is not generated, but only the being of this

house), but without generation and destruction formulae are and are not; for it has been shown that no one begets nor makes these. For this reason, also, there is neither definition of nor demonstration about sensible individual substances, because they have matter whose nature is such that they are capable both of being and of not being; for which reason all the individual instances of them are destructible. If then demonstration is of necessary truths and definition is a scientific process, and if, just as knowledge cannot be sometimes knowledge and sometimes ignorance, but the state which varies thus is opinion, so too demonstration and definition cannot vary thus, but it is opinion that deals with that which can be otherwise than as it is, clearly there can neither be definition of nor demonstration about sensible individuals. For perishing things are obscure to those who have the relevant knowledge, when they have passed from our perception; and though the formulae remain in the soul unchanged, there will no longer be either definition or demonstration. And so when one of the definition-mongers defines any individual, he must recognize that his definition may always be overthrown; for it is not possible to define such things.

Nor is it possible to define any Idea. For the Idea is, as its supporters say, an individual, and can exist apart; and the formula must consist of words; and he who defines must not invent a word (for it would be unknown), but the established words are common to all the members of a class; these then must apply to something besides the thing defined; e.g. if one were defining you, he would say 'an animal which is lean' or 'pale', or something else which will apply also to some one other than you. If any one were to say that perhaps all the attributes taken apart may belong to many subjects, but together they belong only to this one, we must reply first that they belong also to both the elements; e.g. 'two-footed animal'

belongs to animal and to the two-footed. (And in the case of eternal entities this is even necessary, since the elements are prior to and parts of the compound; nay more, they can also exist apart, if 'man' can exist apart. For either neither or both can. If, then, neither can, the genus will not exist apart from the various species; but if it does, the differentia will also.) Secondly, we must reply that 'animal' and 'two-footed' are prior in being to 'two-footed animal'; and things which are prior to others are not destroyed when the others are.

Again, if the Ideas consist of Ideas (as they must, since elements are simpler than the compound), it will be further necessary that the elements also of which the Idea consists, e.g. 'animal' and 'two-footed', should be predicated of many subjects. If not, how will they come to be known? For there will then be an Idea which cannot be predicated of more subjects than one. But this is not thought possible – every Idea is thought to be capable of being shared.

As has been said, then, the impossibility of defining individuals escapes notice in the case of eternal things, especially those which are unique, like the sun or the moon. For people err not only by adding attributes whose removal the sun would survive, e.g. 'going round the earth' or 'night-hidden' (for from their view it follows that if it stands still or is visible, it will no longer be the sun; but it is strange if this is so; for 'the sun' means a certain substance); but also by the mention of attributes which can belong to another subject; e.g. if another thing with the stated attributes comes into existence, clearly it will be a sun; the formula therefore is general. But the sun was supposed to be an individual, like Cleon or Socrates. After all, why does not one of the supporters of the Ideas produce a definition of an Idea? It would become clear, if they tried, that what has now been said is true.

16

Evidently even of the things that are thought to be substances, most are only potencies, – both the parts of animals (for none of them exists separately; and when they are separated, then too they exist, all of them, merely as matter) and earth and fire and air; for none of them is a unity, but as it were a mere heap, till they are worked up and some unity is made out of them. One might most readily suppose the parts of living things and the parts of the soul nearly related to them to turn out to be both, i.e. existent in complete reality as well as in potency, because they have sources of movement in something in their joints; for which reason some animals live when divided. Yet all the parts must exist only potentially, when they are one and continuous by nature, – not by force or by growing into one, for such a phenomenon is an abnormality.

Since the term 'unity' is used like the term 'being', and the substance of that which is one is one, and things whose substance is numerically one are numerically one, evidently neither unity nor being can be the substance of things, just as being an element or a principle cannot be the substance, but we ask what, then, the principle is, that we may reduce the thing to something more knowable. Now of these concepts 'being' and 'unity' are more substantial than 'principle' or 'element' or 'cause', but not even the former are substance, since in general nothing that is common is substance; for substance does not belong to anything but to itself and to that which has it, of which it is the substance. Further, that which is one cannot be in many places at the same time, but that which is common is present in many places at the same time; so that clearly no universal exists apart from its individuals.

But those who say the Forms exist, in one respect are right, in giving the Forms separate existence, if they are substances; but in another respect they are not right, because they say the one over many is a Form. The reason for their doing this is that they cannot declare what are the substances of this sort, the imperishable substances which exist apart from the individual and sensible substances. They make them, then, the same in kind as the perishable things (for this kind of substance we know) – 'man-himself' and 'horse-itself', adding to the sensible things the word 'itself'. Yet even if we had not seen the stars, none the less, I suppose, would they have been eternal substances apart from those which we knew; so that now also if we do not know what non-sensible substances there are, yet it is doubtless necessary that there should he some. – Clearly, then, no universal term is the name of a substance, and no substance is composed of substances.

17

Let us state what, i.e. what kind of thing, substance should be said to be, taking once more another starting-point; for perhaps from this we shall get a clear view also of that substance which exists apart from sensible substances. Since, then, substance is a principle and a cause, let us pursue it from this starting-point. The 'why' is always sought in this form – 'why does one thing attach to some other?' For to inquire why the musical man is a musical man, is either to inquire – as we have said why the man is musical, or it is something else. Now 'why a thing is itself' is a meaningless inquiry (for (to give meaning to the question 'why') the fact or the existence of the thing must already be evident – e.g. that the moon is eclipsed – but the fact that a thing is itself is the single reason and the single cause to be given in answer

to all such questions as why the man is man, or the musician musical', unless one were to answer 'because each thing is inseparable from itself, and its being one just meant this'; this, however, is common to all things and is a short and easy way with the question). But we can inquire why man is an animal of such and such a nature. This, then, is plain, that we are not inquiring why he who is a man is a man. We are inquiring, then, why something is predicable of something (that it is predicable must be clear; for if not, the inquiry is an inquiry into nothing). E.g. why does it thunder? This is the same as 'why is sound produced in the clouds?' Thus the inquiry is about the predication of one thing of another. And why are these things, i.e. bricks and stones, a house? Plainly we are seeking the cause. And this is the essence (to speak abstractly), which in some cases is the end, e.g. perhaps in the case of a house or a bed, and in some cases is the first mover; for this also is a cause. But while the efficient cause is sought in the case of genesis and destruction, the final cause is sought in the case of being also.

The object of the inquiry is most easily overlooked where one term is not expressly predicated of another (e.g. when we inquire 'what man is'), because we do not distinguish and do not say definitely that certain elements make up a certain whole. But we must articulate our meaning before we begin to inquire; if not, the inquiry is on the border-line between being a search for something and a search for nothing. Since we must have the existence of the thing as something given, clearly the question is why the matter is some definite thing; e.g. why are these materials a house? Because that which was the essence of a house is present. And why is this individual thing, or this body having this form, a man? Therefore what we seek is the cause, i.e. the form, by reason of which the matter is some definite thing; and this is the substance of the thing. Evidently, then, in the case of simple terms no inquiry nor teaching is possible; our attitude towards such things is other than that of inquiry.

Since that which is compounded out of something so that the whole is one, not like a heap but like a syllable – now the syllable is not its elements, ba is not the same as b and a, nor is flesh fire and earth (for when these are separated the wholes, i.e. the flesh and the syllable, no longer exist, but the elements of the syllable exist, and so do fire and earth); the syllable, then, is something – not only its elements (the vowel and the consonant) but also something else, and the flesh is not only fire and earth or the hot and the cold, but also something else: – if, then, that something must itself be either an element or composed of elements, (1) if it is an element the same argument will again apply; for flesh will consist of this and fire and earth and something still further, so that the process will go on to infinity. But (2) if it is a compound, clearly it will be a compound not of one but of more than one (or else that one will be the thing itself), so that again in this case we can use the same argument as in the case of flesh or of the syllable. But it would seem that this 'other' is something, and not an element, and that it is the cause which makes this thing flesh and that a syllable. And similarly in all other cases. And this is the substance of each thing (for this is the primary cause of its being); and since, while some things are not substances, as many as are substances are formed in accordance with a nature of their own and by a process of nature, their substance would seem to be this kind of 'nature', which is not an element but a principle. An element, on the other hand, is that into which a thing is divided and which is present in it as matter; e.g. a and b are the elements of the syllable.

Book H

1

We must reckon up the results arising from what has been said, and compute the sum of them, and put the finishing touch to our inquiry. We have said that the causes, principles, and elements of substances are the object of our search. And some substances are recognized by every one, but some have been advocated by particular schools. Those generally recognized are the natural substances, i.e. fire, earth, water, air, &c., the simple bodies; second plants and their parts, and animals and the parts of animals; and finally the physical universe and its parts; while some particular schools say that Forms and the objects of mathematics are substances. But there are arguments which lead to the conclusion that there are other substances, the essence and the substratum. Again, in another way the genus seems more substantial than the various spccies, and the universal than the particulars. And with the universal and the genus the Ideas are connected; it is in virtue of the same argument that they are thought to be substances. And since the essence is substance, and the definition is a formula of the essence, for this reason we have discussed definition and essential predication. Since the definition is a formula, and a formula has parts, we had to consider also with respect to the notion of 'part', what are parts of the substance and what are not, and whether the parts of the substance are also parts of the definition. Further, too, neither the universal nor the genus is a substance; we must inquire later into the Ideas and the objects of mathematics; for some say these are substances as well as the sensible substances.

But now let us resume the discussion of the generally recognized substances. These are the sensible substances, and sensible substances all have matter. The substratum is substance, and this is in one sense the matter (and by matter I mean that which, not being a 'this' actually, is potentially a 'this'), and in another sense the formula or shape (that which being a 'this' can be separately formulated), and thirdly the complex of these two, which alone is generated and destroyed, and is, without qualification, capable of separate existence; for of substances completely expressible in a formula some are separable and some are separable and some are not.

But clearly matter also is substance; for in all the opposite changes that occur there is something which underlies the changes, e.g. in respect of place that which is now here and again elsewhere, and in respect of increase that which is now of one size and again less or greater, and in respect of alteration that which is now healthy and again diseased; and similarly in respect of substance there is something that is now being generated and again being destroyed, and now underlies the process as a 'this' and again underlies it in respect of a privation of positive character. And in this change the others are involved. But in either one or two of the others this is not involved; for it is not necessary if a thing has matter for change of place that it should also have matter for generation and destruction.

The difference between becoming in the full sense and becoming in a qualified sense has been stated in our physical works.

2

Since the substance which exists as underlying and as matter is generally recognized, and this that which exists potentially, it remains for us to say what is the substance, in the sense of actuality, of sensible things. Democritus seems to think there are three kinds of difference between things; the underlying body, the matter, is one and the same, but they differ either in rhythm, i.e. shape, or in turning, i.e. position, or in inter-contact, i.e. order. But evidently there are many differences; for instance, some things are characterized by the mode of composition of their matter, e.g. the things formed by blending, such as honey-water; and others by being bound together, e.g. bundle; and others by being glued together, e.g. a book; and others by being nailed together, e.g. a casket; and others in more than one of these ways; and others by position, e.g. threshold and lintel (for these differ by being placed in a certain way); and others by time, e.g. dinner and breakfast; and others by place, e.g. the winds; and others by the affections proper to sensible things, e.g. hardness and softness, density and rarity, dryness and wetness; and some things by some of these qualities, others by them all, and in general some by excess and some by defect. Clearly, then, the word 'is' has just as many meanings; a thing is a threshold because it lies in such and such a position, and its being means its lying in that position, while being ice means having been solidified in such and such a way. And the being of some things will be defined by all these qualities, because some parts of them are mixed, others are blended, others are bound together, others are solidified, and others use the other differentiae; e.g. the hand or the foot requires such complex definition. We must grasp, then, the kinds of differentiae (for these will be the principles of the being of things), e.g. the things characterized by the more and the less, or by the dense and the rare, and by other such qualities; for all these are forms of excess and defect. And anything that is characterized by

shape or by smoothness and roughness is characterized by the straight and the curved. And for other things their being will mean their being mixed, and their not being will mean the opposite.

It is clear, then, from these facts that, since its substance is the cause of each thing's being, we must seek in these differentiae what is the cause of the being of each of these things. Now none of these differentiae is substance, even when coupled with matter, yet it is what is analogous to substance in each case; and as in substances that which is predicated of the matter is the actuality itself, in all other definitions also it is what most resembles full actuality. E.g. if we had to define a threshold, we should say 'wood or stone in such and such a position', and a house we should define as 'bricks and timbers in such and such a position',(or a purpose may exist as well in some cases), and if we had to define ice we should say 'water frozen or solidified in such and such a way', and harmony is 'such and such a blending of high and low'; and similarly in all other cases.

Obviously, then, the actuality or the formula is different when the matter is different; for in some cases it is the composition, in others the mixing, and in others some other of the attributes we have named. And so, of the people who go in for defining, those who define a house as stones, bricks, and timbers are speaking of the potential house, for these are the matter; but those who propose 'a receptacle to shelter chattels and living beings', or something of the sort, speak of the actuality. Those who combine both of these speak of the third kind of substance, which is composed of matter and form (for the formula that gives the differentiae seems to be an account of the form or actuality, while that which gives the components is rather an account of the matter); and the same is true of the kind of definitions which Archytas used to accept; they are accounts of the combined form and matter. E.g. what is still weather?

Absence of motion in a large expanse of air; air is the matter, and absence of motion is the actuality and substance. What is a calm? Smoothness of sea; the material substratum is the sea, and the actuality or shape is smoothness. It is obvious then, from what has been said, what sensible substance is and how it exists – one kind of it as matter, another as form or actuality, while the third kind is that which is composed of these two.

3

We must not fail to notice that sometimes it is not clear whether a name means the composite substance, or the actuality or form, e.g. whether 'house' is a sign for the composite thing, 'a covering consisting of bricks and stones laid thus and thus', or for the actuality or form, 'a covering', and whether a line is 'twoness in length' or 'twoness', and whether an animal is soul in a body' or 'a soul'; for soul is the substance or actuality of some body. 'Animal' might even be applied to both, not as something definable by one formula, but as related to a single thing. But this question, while important for another purpose, is of no importance for the inquiry into sensible substance; for the essence certainly attaches to the form and the actuality. For 'soul' and 'to be soul' are the same, but 'to be man' and 'man' are not the same, unless even the bare soul is to be called man; and thus on one interpretation the thing is the same as its essence, and on another it is not.

If we examine we find that the syllable does not consist of the letters + juxtaposition, nor is the house bricks + juxtaposition. And this is right; for the juxtaposition or mixing does not consist of those things of which it is the juxtaposition or mixing. And the same is true in all other cases; e.g. if the

threshold is characterized by its position, the position is not constituted by the threshold, but rather the latter is constituted by the former. Nor is man animal + biped, but there must be something besides these, if these are matter, – something which is neither an element in the whole nor a compound, but is the substance; but this people eliminate, and state only the matter. If, then, this is the cause of the thing's being, and if the cause of its being is its substance, they will not be stating the substance itself.

(This, then, must either be eternal or it must be destructible without being ever in course of being destroyed, and must have come to be without ever being in course of coming to be. But it has been proved and explained elsewhere that no one makes or begets the form, but it is the individual that is made, i.e. the complex of form and matter that is generated. Whether the substances of destructible things can exist apart, is not yet at all clear; except that obviously this is impossible in some cases – in the case of things which cannot exist apart from the individual instances, e.g. house or utensil. Perhaps, indeed, neither these things themselves, nor any of the other things which are not formed by nature, are substances at all; for one might say that the nature in natural objects is the only substance to be found in destructible things.)

Therefore the difficulty which used to be raised by the school of Antisthenes and other such uneducated people has a certain timeliness. They said that the 'what' cannot be defined (for the definition so called is a 'long rigmarole') but of what sort a thing, e.g. silver, is, they thought it possible actually to explain, not saying what it is, but that it is like tin. Therefore one kind of substance can be defined and formulated, i.e. the composite kind, whether it be perceptible or intelligible; but the primary parts of which this consists cannot be defined, since a definitory formula predicates something of something, and one

part of the definition must play the part of matter and the other that of form.

It is also obvious that, if substances are in a sense numbers, they are so in this sense and not, as some say, as numbers of units. For a definition is a sort of number; for (1) it is divisible, and into indivisible parts (for definitory formulae are not infinite), and number also is of this nature. And (2) as, when one of the parts of which a number consists has been taken from or added to the number, it is no longer the same number, but a different one, even if it is the very smallest part that has been taken away or added, so the definition and the essence will no longer remain when anything has been taken away or added. And (3) the number must be something in virtue of which it is one, and this these thinkers cannot state, what makes it one, if it is one (for either it is not one but a sort of heap, or if it is, we ought to say what it is that makes one out of many); and the definition is one, but similarly they cannot say what makes it one. And this is a natural result; for the same reason is applicable, and substance is one in the sense which we have explained, and not, as some say, by being a sort of unit or point; each is a complete reality and a definite nature. And (4) as number does not admit of the more and the less, neither does substance, in the sense of form, but if any substance does, it is only the substance which involves matter. Let this, then, suffice for an account of the generation and destruction of so-called substances in what sense it is possible and in what sense impossible – and of the reduction of things to number.

4

Regarding material substance we must not forget that even if all things come from the same first cause or have the same things for their first causes, and if the same matter serves as starting-point for their generation, yet there is a matter proper to each, e.g. for phlegm the sweet or the fat, and for bile the bitter, or something else; though perhaps these come from the same original matter. And there come to be several matters for the same thing, when the one matter is matter for the other; e.g. phlegm comes from the fat and from the sweet, if the fat comes from the sweet; and it comes from bile by analysis of the bile into its ultimate matter. For one thing comes from another in two senses, either because it will be found at a later stage, or because it is produced if the other is analysed into its original constituents. When the matter is one, different things may be produced owing to difference in the moving cause; e.g. from wood may be made both a chest and a bed. But some different things must have their matter different; e.g. a saw could not be made of wood, nor is this in the power of the moving cause; for it could not make a saw of wool or of wood. But if, as a matter of fact, the same thing can be made of different material, clearly the art, i.e. the moving principle, is the same; for if both the matter and the moving cause were different, the product would be so too.

When one inquires into the cause of something, one should, since 'causes' are spoken of in several senses, state all the possible causes. what is the material cause of man? Shall we say 'the menstrual fluid'? What is moving cause? Shall we say 'the seed'? The formal cause? His essence. The final cause? His end. But perhaps the latter two are the same. – It is the proximate causes we must state. What is the material cause? We must name not fire or earth, but the matter peculiar to the thing.

Regarding the substances that are natural and generable, if the causes are really these and of this number and we have to learn the causes, we must inquire thus, if we are to inquire rightly. But in the case of natural but eternal substances another account must be given. For perhaps some have no matter, or not matter of this sort but only such as can be moved in respect of place. Nor does matter belong to those things which exist by nature but are not substances; their substratum is the substance. E.g what is the cause of eclipse? What is its matter? There is none; the moon is that which suffers eclipse. What is the moving cause which extinguished the light? The earth. The final cause perhaps does not exist. The formal principle is the definitory formula, but this is obscure if it does not include the cause. E.g. what is eclipse? Deprivation of light. But if we add 'by the earth's coming in between', this is the formula which includes the cause. In the case of sleep it is not clear what it is that proximately has this affection. Shall we say that it is the animal? Yes, but the animal in virtue of what, i.e. what is the proximate subject? The heart or some other part. Next, by what is it produced? Next, what is the affection – that of the proximate subject, not of the whole animal? Shall we say that it is immobility of such and such a kind? Yes, but to what process in the proximate subject is this due?

5

Since some things are and are not, without coming to be and ceasing to be, e.g. points, if they can be said to be, and in general forms (for it is not 'white' comes to be, but the wood comes to be white, if everything that comes to be comes from something and comes to be something), not all contraries can come from one another, but it is in different senses that a pale man comes

from a dark man, and pale comes from dark. Nor has everything matter, but only those things which come to be and change into one another. Those things which, without ever being in course of changing, are or are not, have no matter.

There is difficulty in the question how the matter of each thing is related to its contrary states. E.g. if the body is potentially healthy, and disease is contrary to health, is it potentially both healthy and diseased? And is water potentially wine and vinegar? We answer that it is the matter of one in virtue of its positive state and its form, and of the other in virtue of the privation of its positive state and the corruption of it contrary to its nature. It is also hard to say why wine is not said to be the matter of vinegar nor potentially vinegar (though vinegar is produced from it), and why a living man is not said to be potentially dead. In fact they are not, but the corruptions in question are accidental, and it is the matter of the animal that is itself in virtue of its corruption the potency and matter of a corpse, and it is water that is the matter of vinegar. For the corpse comes from the animal, and vinegar from wine, as night from day. And all the things which change thus into one another must go back to their matter; e.g. if from a corpse is produced an animal, the corpse first goes back to its matter, and only then becomes an animal; and vinegar first goes back to water, and only then becomes wine.

6

To return to the difficulty which has been stated with respect both to definitions and to numbers, what is the cause of their unity? In the case of all things which have several parts and in which the totality is not, as it were, a mere heap, but the whole

is something beside the parts, there is a cause; for even in bodies contact is the cause of unity in some cases, and in others viscosity or some other such quality. And a definition is a set of words which is one not by being connected together, like the Iliad, but by dealing with one object. – What then, is it that makes man one; why is he one and not many, e.g. animal + biped, especially if there are, as some say, an animal-itself and a biped-itself? Why are not those Forms themselves the man, so that men would exist by participation not in man, nor in one Form, but in two, animal and biped, and in general man would be not one but more than one thing, animal and biped?

Clearly, then, if people proceed thus in their usual manner of definition and speech, they cannot explain and solve the difficulty. But if, as we say, one element is matter and another is form, and one is potentially and the other actually, the question will no longer be thought a difficulty. For this difficulty is the same as would arise if 'round bronze' were the definition of 'cloak'; for this word would be a sign of the definitory formula, so that the question is, what is the cause of the unity of 'round' and 'bronze'? The difficulty disappears, because the one is matter, the other form. What, then, causes this – that which was potentially to be actually – except, in the case of things which are generated, the agent? For there is no other cause of the potential sphere's becoming actually a sphere, but this was the essence of either. Of matter some is intelligible, some perceptible, and in a formula there is always an element of matter as well as one of actuality; e.g. the circle is 'a plane figure'. But of the things which have no matter, either intelligible or perceptible, each is by its nature essentially a kind of unity, as it is essentially a kind of being – individual substance, quality, or quantity (and so neither 'existent' nor 'one' is present in their definitions), and the essence of each of them is by its very nature a kind of unity as it is a kind of being – and so none of these has any reason outside itself, for being

one, nor for being a kind of being; for each is by its nature a kind of being and a kind of unity, not as being in the genus 'being' or 'one' nor in the sense that being and unity can exist apart from particulars.

Owing to the difficulty about unity some speak of 'participation', and raise the question, what is the cause of participation and what is it to participate; and others speak of 'communion', as Lycophron says knowledge is a communion of knowing with the soul; and others say life is a 'composition' or 'connexion' of soul with body. Yet the same account applies to all cases; for being healthy, too, will on this showing be either a 'communion' or a 'connexion' or a 'composition' of soul and health, and the fact that the bronze is a triangle will be a 'composition' of bronze and triangle, and the fact that a thing is white will be a 'composition' of surface and whiteness. The reason is that people look for a unifying formula, and a difference, between potency and complete reality. But, as has been said, the proximate matter and the form are one and the same thing, the one potentially, and the other actually. Therefore it is like asking what in general is the cause of unity and of a thing's being one; for each thing is a unity, and the potential and the actual are somehow one. Therefore there is no other cause here unless there is something which caused the movement from potency into actuality. And all things which have no matter are without qualification essentially unities.

Book Θ

1

We have treated of that which is primarily and to which all the other categories of being are referred – i.e. of substance. For it is in virtue of the concept of substance that the others also are said to be – quantity and quality and the like; for all will be found to involve the concept of substance, as we said in the first part of our work. And since 'being' is in one way divided into individual thing, quality, and quantity, and is in another way distinguished in respect of potency and complete reality, and of function, let us now add a discussion of potency and complete reality. And first let us explain potency in the strictest sense, which is, however, not the most useful for our present purpose. For potency and actuality extend beyond the cases that involve a reference to motion. But when we have spoken of this first kind, we shall in our discussions of actuality' explain the other kinds of potency as well.

We have pointed out elsewhere that 'potency' and the word 'can' have several senses. Of these we may neglect all the potencies that are so called by an equivocation. For some are called so by analogy, as in geometry we say one thing is or is not a 'power' of another by virtue of the presence or absence of some relation between them. But all potencies that conform to the same type are originative sources of some kind, and are called potencies in reference to one primary kind of potency, which is an originative source of change in another thing or in the thing itself qua other. For one kind is a potency of being acted on, i.e. the originative source, in the very thing acted on, of its being passively changed by another thing or by itself qua

other; and another kind is a state of insusceptibility to change for the worse and to destruction by another thing or by the thing itself qua other by virtue of an originative source of change. In all these definitions is implied the formula if potency in the primary sense. – And again these so-called potencies are potencies either of merely acting or being acted on, or of acting or being acted on well, so that even in the formulae of the latter the formulae of the prior kinds of potency are somehow implied.

Obviously, then, in a sense the potency of acting and of being acted on is one (for a thing may be 'capable' either because it can itself be acted on or because something else can be acted on by it), but in a sense the potencies are different. For the one is in the thing acted on; it is because it contains a certain originative source, and because even the matter is an originative source, that the thing acted on is acted on, and one thing by one, another by another; for that which is oily can be burnt, and that which yields in a particular way can be crushed; and similarly in all other cases. But the other potency is in the agent, e.g. heat and the art of building are present, one in that which can produce heat and the other in the man who can build. And so, in so far as a thing is an organic unity, it cannot be acted on by itself; for it is one and not two different things. And 'impotence'and 'impotent' stand for the privation which is contrary to potency of this sort, so that every potency belongs to the same subject and refers to the same process as a corresponding impotence. Privation has several senses; for it means (1) that which has not a certain quality and (2) that which might naturally have it but has not it, either (a) in general or (b) when it might naturally have it, and either (a) in some particular way, e.g. when it has not it completely, or (b) when it has not it at all. And in certain cases if things which naturally have a quality lose it by violence, we say they have suffered privation.

2

Since some such originative sources are present in soulless things, and others in things possessed of soul, and in soul, and in the rational part of the soul, clearly some potencies will, be non-rational and some will be non-rational and some will be accompanied by a rational formula. This is why all arts, i.e. all productive forms of knowledge, are potencies; they are originative sources of change in another thing or in the artist himself considered as other.

And each of those which are accompanied by a rational formula is alike capable of contrary effects, but one non-rational power produces one effect; e.g. the hot is capable only of heating, but the medical art can produce both disease and health. The reason is that science is a rational formula, and the same rational formula explains a thing and its privation, only not in the same way; and in a sense it applies to both, but in a sense it applies rather to the positive fact. Therefore such sciences must deal with contraries, but with one in virtue of their own nature and with the other not in virtue of their nature; for the rational formula applies to one object in virtue of that object's nature, and to the other, in a sense, accidentally. For it is by denial and removal that it exhibits the contrary; for the contrary is the primary privation, and this is the removal of the positive term. Now since contraries do not occur in the same thing, but science is a potency which depends on the possession of a rational formula, and the soul possesses an originative source of movement; therefore, while the wholesome produces only health and the calorific only heat and the frigorific only cold, the scientific man produces both the contrary effects. For the rational formula is one which applies to both, though not in the

same way, and it is in a soul which possesses an originative source of movement; so that the soul will start both processes from the same originative source, having linked them up with the same thing. And so the things whose potency is according to a rational formula act contrariwise to the things whose potency is non-rational; for the products of the former are included under one originative source, the rational formula.

It is obvious also that the potency of merely doing a thing or having it done to one is implied in that of doing it or having it done well, but the latter is not always implied in the former: for he who does a thing well must also do it, but he who does it merely need not also do it well.

3

There are some who say, as the Megaric school does, that a thing 'can' act only when it is acting, and when it is not acting it 'cannot' act, e.g. that he who is not building cannot build, but only he who is building, when he is building; and so in all other cases. It is not hard to see the absurdities that attend this view.

For it is clear that on this view a man will not be a builder unless he is building (for to be a builder is to be able to build), and so with the other arts. If, then, it is impossible to have such arts if one has not at some time learnt and acquired them, and it is then impossible not to have them if one has not sometime lost them (either by forgetfulness or by some accident or by time; for it cannot be by the destruction of the object, for that lasts for ever), a man will not have the art when he has ceased to use it, and yet he may immediately build again; how then will he have got the art? And similarly with regard to lifeless things; nothing will be either cold or hot or sweet or perceptible at all if

people are not perceiving it; so that the upholders of this view will have to maintain the doctrine of Protagoras. But, indeed, nothing will even have perception if it is not perceiving, i.e. exercising its perception. If, then, that is blind which has not sight though it would naturally have it, when it would naturally have it and when it still exists, the same people will be blind many times in the day – and deaf too.

Again, if that which is deprived of potency is incapable, that which is not happening will be incapable of happening; but he who says of that which is incapable of happening either that it is or that it will be will say what is untrue; for this is what incapacity meant. Therefore these views do away with both movement and becoming. For that which stands will always stand, and that which sits will always sit, since if it is sitting it will not get up; for that which, as we are told, cannot get up will be incapable of getting up. But we cannot say this, so that evidently potency and actuality are different (but these views make potency and actuality the same, and so it is no small thing they are seeking to annihilate), so that it is possible that a thing may be capable of being and not he, and capable of not being and yet he, and similarly with the other kinds of predicate; it may be capable of walking and yet not walk, or capable of not walking and yet walk. And a thing is capable of doing something if there will be nothing impossible in its having the actuality of that of which it is said to have the capacity. I mean, for instance, if a thing is capable of sitting and it is open to it to sit, there will be nothing impossible in its actually sitting; and similarly if it is capable of being moved or moving, or of standing or making to stand, or of being or coming to be, or of not being or not coming to be.

The word 'actuality', which we connect with 'complete reality', has, in the main, been extended from movements to other things; for actuality in the strict sense is thought to be identical

with movement. And so people do not assign movement to non-existent things, though they do assign some other predicates. E.g. they say that non-existent things are objects of thought and desire, but not that they are moved; and this because, while ex hypothesi they do not actually exist, they would have to exist actually if they were moved. For of non-existent things some exist potentially; but they do not exist, because they do not exist in complete reality.

4

If what we have described is identical with the capable or convertible with it, evidently it cannot be true to say 'this is capable of being but will not be', which would imply that the things incapable of being would on this showing vanish. Suppose, for instance, that a man – one who did not take account of that which is incapable of being – were to say that the diagonal of the square is capable of being measured but will not be measured, because a thing may well be capable of being or coming to be, and yet not be or be about to be. But from the premisses this necessarily follows, that if we actually supposed that which is not, but is capable of being, to be or to have come to be, there will be nothing impossible in this; but the result will be impossible, for the measuring of the diagonal is impossible. For the false and the impossible are not the same; that you are standing now is false, but that you should be standing is not impossible.

At the same time it is clear that if, when A is real, B must be real, then, when A is possible, B also must be possible. For if B need not be possible, there is nothing to prevent its not being possible. Now let A be supposed possible. Then, when A was

possible, we agreed that nothing impossible followed if A were supposed to be real; and then B must of course be real. But we supposed B to be impossible. Let it be impossible then. If, then, B is impossible, A also must be so. But the first was supposed impossible; therefore the second also is impossible. If, then, A is possible, B also will be possible, if they were so related that if A,is real, B must be real. If, then, A and B being thus related, B is not possible on this condition, and B will not be related as was supposed. And if when A is possible, B must be possible, then if A is real, B also must be real. For to say that B must be possible, if A is possible, means this, that if A is real both at the time when and in the way in which it was supposed capable of being real, B also must then and in that way be real.

5

As all potencies are either innate, like the senses, or come by practice, like the power of playing the flute, or by learning, like artistic power, those which come by practice or by rational formula we must acquire by previous exercise but this is not necessary with those which are not of this nature and which imply passivity.

Since that which is 'capable' is capable of something and at some time in some way (with all the other qualifications which must be present in the definition), and since some things can produce change according to a rational formula and their potencies involve such a formula, while other things are nonrational and their potencies are non-rational, and the former potencies must be in a living thing, while the latter can be both in the living and in the lifeless; as regards potencies of the latter kind, when the agent and the patient meet in the way

appropriate to the potency in question, the one must act and the other be acted on, but with the former kind of potency this is not necessary. For the nonrational potencies are all productive of one effect each, but the rational produce contrary effects, so that if they produced their effects necessarily they would produce contrary effects at the same time; but this is impossible. There must, then, be something else that decides; I mean by this, desire or will. For whichever of two things the animal desires decisively, it will do, when it is present, and meets the passive object, in the way appropriate to the potency in question. Therefore everything which has a rational potency, when it desires that for which it has a potency and in the circumstances in which it has the potency, must do this. And it has the potency in question when the passive object is present and is in a certain state; if not it will not be able to act. (To add the qualification 'if nothing external prevents it' is not further necessary; for it has the potency on the terms on which this is a potency of acting, and it is this not in all circumstances but on certain conditions, among which will be the exclusion of external hindrances; for these are barred by some of the positive qualifications.) And so even if one has a rational wish, or an appetite, to do two things or contrary things at the same time, one will not do them; for it is not on these terms that one has the potency for them, nor is it a potency of doing both at the same time, since one will do the things which it is a potency of doing, on the terms on which one has the potency.

6

Since we have treated of the kind of potency which is related to movement, let us discuss actuality – what, and what kind of thing, actuality is. For in the course of our analysis it will also

become clear, with regard to the potential, that we not only ascribe potency to that whose nature it is to move something else, or to be moved by something else, either without qualification or in some particular way, but also use the word in another sense, which is the reason of the inquiry in the course of which we have discussed these previous senses also. Actuality, then, is the existence of a thing not in the way which we express by 'potentially'; we say that potentially, for instance, a statue of Hermes is in the block of wood and the half-line is in the whole, because it might be separated out, and we call even the man who is not studying a man of science, if he is capable of studying; the thing that stands in contrast to each of these exists actually. Our meaning can be seen in the particular cases by induction, and we must not seek a definition of everything but be content to grasp the analogy, that it is as that which is building is to that which is capable of building, and the waking to the sleeping, and that which is seeing to that which has its eyes shut but has sight, and that which has been shaped out of the matter to the matter, and that which has been wrought up to the unwrought. Let actuality be defined by one member of this antithesis, and the potential by the other. But all things are not said in the same sense to exist actually, but only by analogy – as A is in B or to B, C is in D or to D; for some are as movement to potency, and the others as substance to some sort of matter.

But also the infinite and the void and all similar things are said to exist potentially and actually in a different sense from that which applies to many other things, e.g. to that which sees or walks or is seen. For of the latter class these predicates can at some time be also truly asserted without qualification; for the seen is so called sometimes because it is being seen, sometimes because it is capable of being seen. But the infinite does not exist potentially in the sense that it will ever actually have separate existence; it exists potentially only for knowledge. For the fact that the process of dividing never comes to an end

ensures that this activity exists potentially, but not that the infinite exists separately.

Since of the actions which have a limit none is an end but all are relative to the end, e.g. the removing of fat, or fat-removal, and the bodily parts themselves when one is making them thin are in movement in this way (i.e. without being already that at which the movement aims), this is not an action or at least not a complete one (for it is not an end); but that movement in which the end is present is an action. E.g. at the same time we are seeing and have seen, are understanding and have understood, are thinking and have thought (while it is not true that at the same time we are learning and have learnt, or are being cured and have been cured). At the same time we are living well and have lived well, and are happy and have been happy. If not, the process would have had sometime to cease, as the process of making thin ceases: but, as things are, it does not cease; we are living and have lived. Of these processes, then, we must call the one set movements, and the other actualities. For every movement is incomplete – making thin, learning, walking, building; these are movements, and incomplete at that. For it is not true that at the same time a thing is walking and has walked, or is building and has built, or is coming to be and has come to be, or is being moved and has been moved, but what is being moved is different from what has been moved, and what is moving from what has moved. But it is the same thing that at the same time has seen and is seeing, seeing, or is thinking and has thought. The latter sort of process, then, I call an actuality, and the former a movement.

7

What, and what kind of thing, the actual is, may be taken as explained by these and similar considerations. But we must distinguish when a thing exists potentially and when it does not; for it is not at any and every time. E.g. is earth potentially a man? No – but rather when it has already become seed, and perhaps not even then. It is just as it is with being healed; not everything can be healed by the medical art or by luck, but there is a certain kind of thing which is capable of it, and only this is potentially healthy. And (1) the delimiting mark of that which as a result of thought comes to exist in complete reality from having existed potentially is that if the agent has willed it it comes to pass if nothing external hinders, while the condition on the other side – viz. in that which is healed – is that nothing in it hinders the result. It is on similar terms that we have what is potentially a house; if nothing in the thing acted on – i.e. in the matter – prevents it from becoming a house, and if there is nothing which must be added or taken away or changed, this is potentially a house; and the same is true of all other things the source of whose becoming is external. And (2) in the cases in which the source of the becoming is in the very thing which comes to be, a thing is potentially all those things which it will be of itself if nothing external hinders it. E.g. the seed is not yet potentially a man; for it must be deposited in something other than itself and undergo a change. But when through its own motive principle it has already got such and such attributes, in this state it is already potentially a man; while in the former state it needs another motive principle, just as earth is not yet potentially a statue (for it must first change in order to become brass.)

It seems that when we call a thing not something else but 'thaten' – e.g. a casket is not 'wood' but 'wooden', and wood is not 'earth' but 'earthen', and again earth will illustrate our point

if it is similarly not something else but ‘thaten’ – that other thing is always potentially (in the full sense of that word) the thing which comes after it in this series. E.g. a casket is not ‘earthen’ nor ‘earth’, but ‘wooden’; for this is potentially a casket and this is the matter of a casket, wood in general of a casket in general, and this particular wood of this particular casket. And if there is a first thing, which is no longer, in reference to something else, called ‘thaten’, this is prime matter; e.g. if earth is ‘airy’ and air is not ‘fire’ but ‘fiery’, fire is prime matter, which is not a ‘this’. For the subject or substratum is differentiated by being a ‘this’ or not being one; i.e. the substratum of modifications is, e.g. a man, i.e. a body and a soul, while the modification is ‘musical’ or ‘pale’. (The subject is called, when music comes to be present in it, not ‘music’ but ‘musical’, and the man is not ‘paleness’ but ‘pale’, and not ‘ambulation’ or ‘movement’ but ‘walking’ or ‘moving’, – which is akin to the ‘thaten’.) Wherever this is so, then, the ultimate subject is a substance; but when this is not so but the predicate is a form and a ‘this’, the ultimate subject is matter and material substance. And it is only right that ‘thaten’ should be used with reference both to the matter and to the accidents; for both are indeterminates.

We have stated, then, when a thing is to be said to exist potentially and when it is not.

8

From our discussion of the various senses of ‘prior’, it is clear that actuality is prior to potency. And I mean by potency not only that definite kind which is said to be a principle of change in another thing or in the thing itself regarded as other, but in

general every principle of movement or of rest. For nature also is in the same genus as potency; for it is a principle of movement – not, however, in something else but in the thing itself qua itself. To all such potency, then, actuality is prior both in formula and in substantiality; and in time it is prior in one sense, and in another not.

(1) Clearly it is prior in formula; for that which is in the primary sense potential is potential because it is possible for it to become active; e.g. I mean by 'capable of building' that which can build, and by 'capable of seeing' that which can see, and by 'visible' that which can be seen. And the same account applies to all other cases, so that the formula and the knowledge of the one must precede the knowledge of the other.

(2) In time it is prior in this sense: the actual which is identical in species though not in number with a potentially existing thing is to it. I mean that to this particular man who now exists actually and to the corn and to the seeing subject the matter and the seed and that which is capable of seeing, which are potentially a man and corn and seeing, but not yet actually so, are prior in time; but prior in time to these are other actually existing things, from which they were produced. For from the potentially existing the actually existing is always produced by an actually existing thing, e.g. man from man, musician by musician; there is always a first mover, and the mover already exists actually. We have said in our account of substance that everything that is produced is something produced from something and by something, and that the same in species as it.

This is why it is thought impossible to be a builder if one has built nothing or a harper if one has never played the harp; for he who learns to play the harp learns to play it by playing it, and all other learners do similarly. And thence arose the sophistical quibble, that one who does not possess a science

will be doing that which is the object of the science; for he who is learning it does not possess it. But since, of that which is coming to be, some part must have come to be, and, of that which, in general, is changing, some part must have changed (this is shown in the treatise on movement), he who is learning must, it would seem, possess some part of the science. But here too, then, it is clear that actuality is in this sense also, viz. in order of generation and of time, prior to potency.

But (3) it is also prior in substantiality; firstly, (a) because the things that are posterior in becoming are prior in form and in substantiality (e.g. man is prior to boy and human being to seed; for the one already has its form, and the other has not), and because everything that comes to be moves towards a principle, i.e. an end (for that for the sake of which a thing is, is its principle, and the becoming is for the sake of the end), and the actuality is the end, and it is for the sake of this that the potency is acquired. For animals do not see in order that they may have sight, but they have sight that they may see. And similarly men have the art of building that they may build, and theoretical science that they may theorize; but they do not theorize that they may have theoretical science, except those who are learning by practice; and these do not theorize except in a limited sense, or because they have no need to theorize. Further, matter exists in a potential state, just because it may come to its form; and when it exists actually, then it is in its form. And the same holds good in all cases, even those in which the end is a movement. And so, as teachers think they have achieved their end when they have exhibited the pupil at work, nature does likewise. For if this is not the case, we shall have Pauson's Hermes over again, since it will be hard to say about the knowledge, as about the figure in the picture, whether it is within or without. For the action is the end, and the actuality is the action. And so even the word 'actuality' is derived from 'action', and points to the complete reality.

And while in some cases the exercise is the ultimate thing (e.g. in sight the ultimate thing is seeing, and no other product besides this results from sight), but from some things a product follows (e.g. from the art of building there results a house as well as the act of building), yet none the less the act is in the former case the end and in the latter more of an end than the potency is. For the act of building is realized in the thing that is being built, and comes to be, and is, at the same time as the house.

Where, then, the result is something apart from the exercise, the actuality is in the thing that is being made, e.g. the act of building is in the thing that is being built and that of weaving in the thing that is being woven, and similarly in all other cases, and in general the movement is in the thing that is being moved; but where there is no product apart from the actuality, the actuality is present in the agents, e.g. the act of seeing is in the seeing subject and that of theorizing in the theorizing subject and the life is in the soul (and therefore well-being also; for it is a certain kind of life).

Obviously, therefore, the substance or form is actuality. According to this argument, then, it is obvious that actuality is prior in substantial being to potency; and as we have said, one actuality always precedes another in time right back to the actuality of the eternal prime mover.

But (b) actuality is prior in a stricter sense also; for eternal things are prior in substance to perishable things, and no eternal thing exists potentially. The reason is this. Every potency is at one and the same time a potency of the opposite; for, while that which is not capable of being present in a subject cannot be present, everything that is capable of being may possibly not be actual. That, then, which is capable of being may either be or not be; the same thing, then, is capable both of being and of not

being. And that which is capable of not being may possibly not be; and that which may possibly not be is perishable, either in the full sense, or in the precise sense in which it is said that it possibly may not be, i.e. in respect either of place or of quantity or quality; 'in the full sense' means 'in respect of substance'. Nothing, then, which is in the full sense imperishable is in the full sense potentially existent (though there is nothing to prevent its being so in some respect, e.g. potentially of a certain quality or in a certain place); all imperishable things, then, exist actually. Nor can anything which is of necessity exist potentially; yet these things are primary; for if these did not exist, nothing would exist. Nor does eternal movement, if there be such, exist potentially; and, if there is an eternal mobile, it is not in motion in virtue of a potentiality, except in respect of 'whence' and 'whither' (there is nothing to prevent its having matter which makes it capable of movement in various directions). And so the sun and the stars and the whole heaven are ever active, and there is no fear that they may sometime stand still, as the natural philosophers fear they may. Nor do they tire in this activity; for movement is not for them, as it is for perishable things, connected with the potentiality for opposites, so that the continuity of the movement should be laborious; for it is that kind of substance which is matter and potency, not actuality, that causes this.

Imperishable things are imitated by those that are involved in change, e.g. earth and fire. For these also are ever active; for they have their movement of themselves and in themselves. But the other potencies, according to our previous discussion, are all potencies for opposites; for that which can move another in this way can also move it not in this way, i.e. if it acts according to a rational formula; and the same non-rational potencies will produce opposite results by their presence or absence.

If, then, there are any entities or substances such as the dialecticians say the Ideas are, there must be something much more scientific than science-itself and something more mobile than movement-itself; for these will be more of the nature of actualities, while science-itself and movement-itself are potencies for these.

Obviously, then, actuality is prior both to potency and to every principle of change.

9

That the actuality is also better and more valuable than the good potency is evident from the following argument. Everything of which we say that it can do something, is alike capable of contraries, e.g. that of which we say that it can be well is the same as that which can be ill, and has both potencies at once; for the same potency is a potency of health and illness, of rest and motion, of building and throwing down, of being built and being thrown down. The capacity for contraries, then, is present at the same time; but contraries cannot be present at the same time, and the actualities also cannot be present at the same time, e.g. health and illness. Therefore, while the good must be one of them, the capacity is both alike, or neither; the actuality, then, is better. Also in the case of bad things the end or actuality must be worse than the potency; for that which 'can' is both contraries alike. Clearly, then, the bad does not exist apart from bad things; for the bad is in its nature posterior to the potency. And therefore we may also say that in the things which are from the beginning, i.e. in eternal things, there is nothing bad, nothing defective, nothing perverted (for perversion is something bad).

It is an activity also that geometrical constructions are discovered; for we find them by dividing. If the figures had been already divided, the constructions would have been obvious; but as it is they are present only potentially. Why are the angles of the triangle equal to two right angles? Because the angles about one point are equal to two right angles. If, then, the line parallel to the side had been already drawn upwards, the reason would have been evident to any one as soon as he saw the figure. Why is the angle in a semicircle in all cases a right angle? If three lines are equal the two which form the base, and the perpendicular from the centre – the conclusion is evident at a glance to one who knows the former proposition. Obviously, therefore, the potentially existing constructions are discovered by being brought to actuality; the reason is that the geometer's thinking is an actuality; so that the potency proceeds from an actuality; and therefore it is by making constructions that people come to know them (though the single actuality is later in generation than the corresponding potency). (See diagram.)

10

The terms 'being' and 'non-being' are employed firstly with reference to the categories, and secondly with reference to the potency or actuality of these or their non-potency or nonactuality, and thirdly in the sense of true and false. This depends, on the side of the objects, on their being combined or separated, so that he who thinks the separated to be separated and the combined to be combined has the truth, while he whose thought is in a state contrary to that of the objects is in error. This being so, when is what is called truth or falsity present, and when is it not? We must consider what we mean by these terms. It is not because we think truly that you are

pale, that you are pale, but because you are pale we who say this have the truth. If, then, some things are always combined and cannot be separated, and others are always separated and cannot be combined, while others are capable either of combination or of separation, 'being' is being combined and one, and 'not being' is being not combined but more than one. Regarding contingent facts, then, the same opinion or the same statement comes to be false and true, and it is possible for it to be at one time correct and at another erroneous; but regarding things that cannot be otherwise opinions are not at one time true and at another false, but the same opinions are always true or always false.

But with regard to incomposites, what is being or not being, and truth or falsity? A thing of this sort is not composite, so as to 'be' when it is compounded, and not to 'be' if it is separated, like 'that the wood is white' or 'that the diagonal is incommensurable'; nor will truth and falsity be still present in the same way as in the previous cases. In fact, as truth is not the same in these cases, so also being is not the same; but (a) truth or falsity is as follows – contact and assertion are truth (assertion not being the same as affirmation), and ignorance is non-contact. For it is not possible to be in error regarding the question what a thing is, save in an accidental sense; and the same holds good regarding non-composite substances (for it is not possible to be in error about them). And they all exist actually, not potentially; for otherwise they would have come to be and ceased to be; but, as it is, being itself does not come to be (nor cease to be); for if it had done so it would have had to come out of something. About the things, then, which are essences and actualities, it is not possible to be in error, but only to know them or not to know them. But we do inquire what they are, viz. whether they are of such and such a nature or not.

(b) As regards the 'being' that answers to truth and the 'non-being' that answers to falsity, in one case there is truth if the subject and the attribute are really combined, and falsity if they are not combined; in the other case, if the object is existent it exists in a particular way, and if it does not exist in this way does not exist at all. And truth means knowing these objects, and falsity does not exist, nor error, but only ignorance – and not an ignorance which is like blindness; for blindness is akin to a total absence of the faculty of thinking.

It is evident also that about unchangeable things there can be no error in respect of time, if we assume them to be unchangeable. E.g. if we suppose that the triangle does not change, we shall not suppose that at one time its angles are equal to two right angles while at another time they are not (for that would imply change). It is possible, however, to suppose that one member of such a class has a certain attribute and another has not; e.g. while we may suppose that no even number is prime, we may suppose that some are and some are not. But regarding a numerically single number not even this form of error is possible; for we cannot in this case suppose that one instance has an attribute and another has not, but whether our judgement be true or false, it is implied that the fact is eternal.

Book I

1

We have said previously, in our distinction of the various meanings of words, that 'one' has several meanings; the things that are directly and of their own nature and not accidentally called one may be summarized under four heads, though the word is used in more senses. (1) There is the continuous, either in general, or especially that which is continuous by nature and not by contact nor by being together; and of these, that has more unity and is prior, whose movement is more indivisible and simpler. (2) That which is a whole and has a certain shape and form is one in a still higher degree; and especially if a thing is of this sort by nature, and not by force like the things which are unified by glue or nails or by being tied together, i.e. if it has in itself the cause of its continuity. A thing is of this sort because its movement is one and indivisible in place and time; so that evidently if a thing has by nature a principle of movement that is of the first kind (i.e. local movement) and the first in that kind (i.e. circular movement), this is in the primary sense one extended thing. Some things, then, are one in this way, qua continuous or whole, and the other things that are one are those whose definition is one. Of this sort are the things the thought of which is one, i.e. those the thought of which is indivisible; and it is indivisible if the thing is indivisible in kind or in number. (3) In number, then, the individual is indivisible, and (4) in kind, that which in intelligibility and in knowledge is indivisible, so that that which causes substances to be one must be one in the primary sense. 'One', then, has all these meanings – the naturally continuous and the whole, and the individual and the universal. And all these are one because in some cases

the movement, in others the thought or the definition is indivisible.

But it must be observed that the questions, what sort of things are said to be one, and what it is to be one and what is the definition of it, should not be assumed to be the same. 'One' has all these meanings, and each of the things to which one of these kinds of unity belongs will be one; but 'to be one' will sometimes mean being one of these things, and sometimes being something else which is even nearer to the meaning of the word 'one' while these other things approximate to its application. This is also true of 'element' or 'cause', if one had both to specify the things of which it is predicable and to render the definition of the word. For in a sense fire is an element (and doubtless also 'the indefinite' or something else of the sort is by its own nature the element), but in a sense it is not; for it is not the same thing to be fire and to be an element, but while as a particular thing with a nature of its own fire is an element, the name 'element' means that it has this attribute, that there is something which is made of it as a primary constituent. And so with 'cause' and 'one' and all such terms. For this reason, too, 'to be one' means 'to be indivisible, being essentially one means a «this» and capable of being isolated either in place, or in form or thought'; or perhaps 'to be whole and indivisible'; but it means especially 'to be the first measure of a kind', and most strictly of quantity; for it is from this that it has been extended to the other categories. For measure is that by which quantity is known; and quantity qua quantity is known either by a 'one' or by a number, and all number is known by a 'one'. Therefore all quantity qua quantity is known by the one, and that by which quantities are primarily known is the one itself; and so the one is the starting-point of number qua number. And hence in the other classes too 'measure' means that by which each is first known, and the measure of each is a unit – in length, in breadth, in depth, in weight, in speed. (The words 'weight' and 'speed'

are common to both contraries; for each of them has two meanings – ‘weight’ means both that which has any amount of gravity and that which has an excess of gravity, and ‘speed’ both that which has any amount of movement and that which has an excess of movement; for even the slow has a certain speed and the comparatively light a certain weight.)

In all these, then, the measure and starting-point is something one and indivisible, since even in lines we treat as indivisible the line a foot long. For everywhere we seek as the measure something one and indivisible; and this is that which is simple either in quality or in quantity. Now where it is thought impossible to take away or to add, there the measure is exact (hence that of number is most exact; for we posit the unit as indivisible in every respect); but in all other cases we imitate this sort of measure. For in the case of a furlong or a talent or of anything comparatively large any addition or subtraction might more easily escape our notice than in the case of something smaller; so that the first thing from which, as far as our perception goes, nothing can be subtracted, all men make the measure, whether of liquids or of solids, whether of weight or of size; and they think they know the quantity when they know it by means of this measure. And indeed they know movement too by the simple movement and the quickest; for this occupies least time. And so in astronomy a ‘one’ of this sort is the starting-point and measure (for they assume the movement of the heavens to be uniform and the quickest, and judge the others by reference to it), and in music the quarter-tone (because it is the least interval), and in speech the letter. And all these are ones in this sense – not that ‘one’ is something predicable in the same sense of all of these, but in the sense we have mentioned.

But the measure is not always one in number – sometimes there are several; e.g. the quarter-tones (not to the ear, but as

determined by the ratios) are two, and the articulate sounds by which we measure are more than one, and the diagonal of the square and its side are measured by two quantities, and all spatial magnitudes reveal similar varieties of unit. Thus, then, the one is the measure of all things, because we come to know the elements in the substance by dividing the things either in respect of quantity or in respect of kind. And the one is indivisible just because the first of each class of things is indivisible. But it is not in the same way that every 'one' is indivisible e.g. a foot and a unit; the latter is indivisible in every respect, while the former must be placed among things which are undivided to perception, as has been said already – only to perception, for doubtless every continuous thing is divisible.

The measure is always homogeneous with the thing measured; the measure of spatial magnitudes is a spatial magnitude, and in particular that of length is a length, that of breadth a breadth, that of articulate sound an articulate sound, that of weight a weight, that of units a unit. (For we must state the matter so, and not say that the measure of numbers is a number; we ought indeed to say this if we were to use the corresponding form of words, but the claim does not really correspond – it is as if one claimed that the measure of units is units and not a unit; number is a plurality of units.)

Knowledge, also, and perception, we call the measure of things for the same reason, because we come to know something by them – while as a matter of fact they are measured rather than measure other things. But it is with us as if some one else measured us and we came to know how big we are by seeing that he applied the cubit-measure to such and such a fraction of us. But Protagoras says 'man is the measure of all things', as if he had said 'the man who knows' or 'the man who perceives'; and these because they have respectively knowledge and perception, which we say are the measures of objects. Such

thinkers are saying nothing, then, while they appear to be saying something remarkable.

Evidently, then, unity in the strictest sense, if we define it according to the meaning of the word, is a measure, and most properly of quantity, and secondly of quality. And some things will be one if they are indivisible in quantity, and others if they are indivisible in quality; and so that which is one is indivisible, either absolutely or qua one.

2

With regard to the substance and nature of the one we must ask in which of two ways it exists. This is the very question that we reviewed in our discussion of problems, viz. what the one is and how we must conceive of it, whether we must take the one itself as being a substance (as both the Pythagoreans say in earlier and Plato in later times), or there is, rather, an underlying nature and the one should be described more intelligibly and more in the manner of the physical philosophers, of whom one says the one is love, another says it is air, and another the indefinite.

If, then, no universal can be a substance, as has been said our discussion of substance and being, and if being itself cannot be a substance in the sense of a one apart from the many (for it is common to the many), but is only a predicate, clearly unity also cannot be a substance; for being and unity are the most universal of all predicates. Therefore, on the one hand, genera are not certain entities and substances separable from other things; and on the other hand the one cannot be a genus, for the same reasons for which being and substance cannot be genera.

Further, the position must be similar in all the kinds of unity. Now 'unity' has just as many meanings as 'being'; so that since in the sphere of qualities the one is something definite – some particular kind of thing – and similarly in the sphere of quantities, clearly we must in every category ask what the one is, as we must ask what the existent is, since it is not enough to say that its nature is just to be one or existent. But in colours the one is a colour, e.g. white, and then the other colours are observed to be produced out of this and black, and black is the privation of white, as darkness of light. Therefore if all existent things were colours, existent things would have been a number, indeed, but of what? Clearly of colours; and the 'one' would have been a particular 'one', i.e. white. And similarly if all existing things were tunes, they would have been a number, but a number of quarter-tones, and their essence would not have been number; and the one would have been something whose substance was not to be one but to be the quarter-tone. And similarly if all existent things had been articulate sounds, they would have been a number of letters, and the one would have been a vowel. And if all existent things were rectilinear figures, they would have been a number of figures, and the one would have been the triangle. And the same argument applies to all other classes. Since, therefore, while there are numbers and a one both in affections and in qualities and in quantities and in movement, in all cases the number is a number of particular things and the one is one something, and its substance is not just to be one, the same must be true of substances also; for it is true of all cases alike.

That the one, then, in every class is a definite thing, and in no case is its nature just this, unity, is evident; but as in colours the one-itself which we must seek is one colour, so too in substance the one-itself is one substance. That in a sense unity means the same as being is clear from the facts that its meanings correspond to the categories one to one, and it is not comprised

within any category (e.g. it is comprised neither in 'what a thing is' nor in quality, but is related to them just as being is); that in 'one man' nothing more is predicated than in 'man' (just as being is nothing apart from substance or quality or quantity); and that to be one is just to be a particular thing.

3

The one and the many are opposed in several ways, of which one is the opposition of the one and plurality as indivisible and divisible; for that which is either divided or divisible is called a plurality, and that which is indivisible or not divided is called one. Now since opposition is of four kinds, and one of these two terms is privative in meaning, they must be contraries, and neither contradictory nor correlative in meaning. And the one derives its name and its explanation from its contrary, the indivisible from the divisible, because plurality and the divisible is more perceptible than the indivisible, so that in definition plurality is prior to the indivisible, because of the conditions of perception.

To the one belong, as we indicated graphically in our distinction of the contraries, the same and the like and the equal, and to plurality belong the other and the unlike and the unequal. 'The same' has several meanings; (1) we sometimes mean 'the same numerically'; again, (2) we call a thing the same if it is one both in definition and in number, e.g. you are one with yourself both in form and in matter; and again, (3) if the definition of its primary essence is one; e.g. equal straight lines are the same, and so are equal and equal-angled quadrilaterals; there are many such, but in these equality constitutes unity.

Things are like if, not being absolutely the same, nor without difference in respect of their concrete substance, they are the same in form; e.g. the larger square is like the smaller, and unequal straight lines are like; they are like, but not absolutely the same. Other things are like, if, having the same form, and being things in which difference of degree is possible, they have no difference of degree. Other things, if they have a quality that is in form one and same – e.g. whiteness – in a greater or less degree, are called like because their form is one. Other things are called like if the qualities they have in common are more numerous than those in which they differ – either the qualities in general or the prominent qualities; e.g. tin is like silver, qua white, and gold is like fire, qua yellow and red.

Evidently, then, 'other' and 'unlike' also have several meanings. And the other in one sense is the opposite of the same (so that everything is either the same as or other than everything else). In another sense things are other unless both their matter and their definition are one (so that you are other than your neighbour). The other in the third sense is exemplified in the objects of mathematics. 'Other or the same' can therefore be predicated of everything with regard to everything else – but only if the things are one and existent, for 'other' is not the contradictory of 'the same'; which is why it is not predicated of non-existent things (while 'not the same' is so predicated). It is predicated of all existing things; for everything that is existent and one is by its very nature either one or not one with anything else.

The other, then, and the same are thus opposed. But difference is not the same as otherness. For the other and that which it is other than need not be other in some definite respect (for everything that is existent is either other or the same), but that which is different is different from some particular thing in some particular respect, so that there must be something

identical whereby they differ. And this identical thing is genus or species; for everything that differs differs either in genus or in species, in genus if the things have not their matter in common and are not generated out of each other (i.e. if they belong to different figures of predication), and in species if they have the same genus ('genus' meaning that identical thing which is essentially predicated of both the different things).

Contraries are different, and contrariety is a kind of difference. That we are right in this supposition is shown by induction. For all of these too are seen to be different; they are not merely other, but some are other in genus, and others are in the same line of predication, and therefore in the same genus, and the same in genus. We have distinguished elsewhere what sort of things are the same or other in genus.

4

Since things which differ may differ from one another more or less, there is also a greatest difference, and this I call contrariety. That contrariety is the greatest difference is made clear by induction. For things which differ in genus have no way to one another, but are too far distant and are not comparable; and for things that differ in species the extremes from which generation takes place are the contraries, and the distance between extremes – and therefore that between the contraries – is the greatest.

But surely that which is greatest in each class is complete. For that is greatest which cannot be exceeded, and that is complete beyond which nothing can be found. For the complete difference marks the end of a series (just as the other things which are called complete are so called because they have

attained an end), and beyond the end there is nothing; for in everything it is the extreme and includes all else, and therefore there is nothing beyond the end, and the complete needs nothing further. From this, then, it is clear that contrariety is complete difference; and as contraries are so called in several senses, their modes of completeness will answer to the various modes of contrariety which attach to the contraries.

This being so, it is clear that one thing have more than one contrary (for neither can there be anything more extreme than the extreme, nor can there be more than two extremes for the one interval), and, to put the matter generally, this is clear if contrariety is a difference, and if difference, and therefore also the complete difference, must be between two things.

And the other commonly accepted definitions of contraries are also necessarily true. For not only is (1) the complete difference the greatest difference (for we can get no difference beyond it of things differing either in genus or in species; for it has been shown that there is no 'difference' between anything and the things outside its genus, and among the things which differ in species the complete difference is the greatest); but also (2) the things in the same genus which differ most are contrary (for the complete difference is the greatest difference between species of the same genus); and (3) the things in the same receptive material which differ most are contrary (for the matter is the same for contraries); and (4) of the things which fall under the same faculty the most different are contrary (for one science deals with one class of things, and in these the complete difference is the greatest).

The primary contrariety is that between positive state and privation – not every privation, however (for 'privation' has several meanings), but that which is complete. And the other contraries must be called so with reference to these, some

because they possess these, others because they produce or tend to produce them, others because they are acquisitions or losses of these or of other contraries. Now if the kinds of opposition are contradiction and privation and contrariety and relation, and of these the first is contradiction, and contradiction admits of no intermediate, while contraries admit of one, clearly contradiction and contrariety are not the same. But privation is a kind of contradiction; for what suffers privation, either in general or in some determinate way, either that which is quite incapable of having some attribute or that which, being of such a nature as to have it, has it not; here we have already a variety of meanings, which have been distinguished elsewhere. Privation, therefore, is a contradiction or incapacity which is determinate or taken along with the receptive material. This is the reason why, while contradiction does not admit of an intermediate, privation sometimes does; for everything is equal or not equal, but not everything is equal or unequal, or if it is, it is only within the sphere of that which is receptive of equality. If, then, the comings-to-be which happen to the matter start from the contraries, and proceed either from the form and the possession of the form or from a privation of the form or shape, clearly all contrariety must be privation, but presumably not all privation is contrariety (the reason being that that has suffered privation may have suffered it in several ways); for it is only the extremes from which changes proceed that are contraries.

And this is obvious also by induction. For every contrariety involves, as one of its terms, a privation, but not all cases are alike; inequality is the privation of equality and unlikeness of likeness, and on the other hand vice is the privation of virtue. But the cases differ in a way already described; in one case we mean simply that the thing has suffered privation, in another case that it has done so either at a certain time or in a certain part (e.g. at a certain age or in the dominant part), or

throughout. This is why in some cases there is a mean (there are men who are neither good nor bad), and in others there is not (a number must be either odd or even). Further, some contraries have their subject defined, others have not. Therefore it is evident that one of the contraries is always privative; but it is enough if this is true of the first – i.e. the generic – contraries, e.g. the one and the many; for the others can be reduced to these.

5

Since one thing has one contrary, we might raise the question how the one is opposed to the many, and the equal to the great and the small. For if we used the word 'whether' only in an antithesis such as 'whether it is white or black', or 'whether it is white or not white' (we do not ask 'whether it is a man or white'), unless we are proceeding on a prior assumption and asking something such as 'whether it was Cleon or Socrates that came' as this is not a necessary disjunction in any class of things; yet even this is an extension from the case of opposites; for opposites alone cannot be present together; and we assume this incompatibility here too in asking which of the two came; for if they might both have come, the question would have been absurd; but if they might, even so this falls just as much into an antithesis, that of the 'one or many', i.e. 'whether both came or one of the two': – if, then, the question 'whether' is always concerned with opposites, and we can ask 'whether it is greater or less or equal', what is the opposition of the equal to the other two? It is not contrary either to one alone or to both; for why should it be contrary to the greater rather than to the less? Further, the equal is contrary to the unequal. Therefore if it is contrary to the greater and the less, it will be contrary to more

things than one. But if the unequal means the same as both the greater and the less together, the equal will be opposite to both (and the difficulty supports those who say the unequal is a 'two'), but it follows that one thing is contrary to two others, which is impossible. Again, the equal is evidently intermediate between the great and the small, but no contrariety is either observed to be intermediate, or, from its definition, can be so; for it would not be complete if it were intermediate between any two things, but rather it always has something intermediate between its own terms.

It remains, then, that it is opposed either as negation or as privation. It cannot be the negation or privation of one of the two; for why of the great rather than of the small? It is, then, the privative negation of both. This is why 'whether' is said with reference to both, not to one of the two (e.g. 'whether it is greater or equal' or 'whether it is equal or less'); there are always three cases. But it is not a necessary privation; for not everything which is not greater or less is equal, but only the things which are of such a nature as to have these attributes.

The equal, then, is that which is neither great nor small but is naturally fitted to be either great or small; and it is opposed to both as a privative negation (and therefore is also intermediate). And that which is neither good nor bad is opposed to both, but has no name; for each of these has several meanings and the recipient subject is not one; but that which is neither white nor black has more claim to unity. Yet even this has not one name, though the colours of which this negation is privatively predicated are in a way limited; for they must be either grey or yellow or something else of the kind. Therefore it is an incorrect criticism that is passed by those who think that all such phrases are used in the same way, so that that which is neither a shoe nor a hand would be intermediate between a shoe and a hand, since that which is neither good nor bad is intermediate

between the good and the bad – as if there must be an intermediate in all cases. But this does not necessarily follow. For the one phrase is a joint denial of opposites between which there is an intermediate and a certain natural interval; but between the other two there is no 'difference'; for the things, the denials of which are combined, belong to different classes, so that the substratum is not one.

6

We might raise similar questions about the one and the many. For if the many are absolutely opposed to the one, certain impossible results follow. One will then be few, whether few be treated here as singular or plural; for the many are opposed also to the few. Further, two will be many, since the double is multiple and 'double' derives its meaning from 'two'; therefore one will be few; for what is that in comparison with which two are many, except one, which must therefore be few? For there is nothing fewer. Further, if the much and the little are in plurality what the long and the short are in length, and whatever is much is also many, and the many are much (unless, indeed, there is a difference in the case of an easily-bounded continuum), the little (or few) will be a plurality. Therefore one is a plurality if it is few; and this it must be, if two are many. But perhaps, while the 'many' are in a sense said to be also 'much', it is with a difference; e.g. water is much but not many. But 'many' is applied to the things that are divisible; in the one sense it means a plurality which is excessive either absolutely or relatively (while 'few' is similarly a plurality which is deficient), and in another sense it means number, in which sense alone it is opposed to the one. For we say 'one or many', just as if one were to say 'one and ones' or 'white thing and

white things', or to compare the things that have been measured with the measure. It is in this sense also that multiples are so called. For each number is said to be many because it consists of ones and because each number is measurable by one; and it is 'many' as that which is opposed to one, not to the few. In this sense, then, even two is many – not, however, in the sense of a plurality which is excessive either relatively or absolutely; it is the first plurality. But without qualification two is few; for it is first plurality which is deficient (for this reason Anaxagoras was not right in leaving the subject with the statement that 'all things were together, boundless both in plurality and in smallness' – where for 'and in smallness' he should have said 'and in fewness'; for they could not have been boundless in fewness), since it is not one, as some say, but two, that make a few.

The one is opposed then to the many in numbers as measure to thing measurable; and these are opposed as are the relatives which are not from their very nature relatives. We have distinguished elsewhere the two senses in which relatives are so called: – (1) as contraries; (2) as knowledge to thing known, a term being called relative because another is relative to it. There is nothing to prevent one from being fewer than something, e.g. than two; for if one is fewer, it is not therefore few. Plurality is as it were the class to which number belongs; for number is plurality measurable by one, and one and number are in a sense opposed, not as contrary, but as we have said some relative terms are opposed; for inasmuch as one is measure and the other measurable, they are opposed. This is why not everything that is one is a number; i.e. if the thing is indivisible it is not a number. But though knowledge is similarly spoken of as relative to the knowable, the relation does not work out similarly; for while knowledge might be thought to be the measure, and the knowable the thing measured, the fact that all knowledge is knowable, but not all that is knowable is knowledge, because in

a sense knowledge is measured by the knowable. – Plurality is contrary neither to the few (the many being contrary to this as excessive plurality to plurality exceeded), nor to the one in every sense; but in the one sense these are contrary, as has been said, because the former is divisible and the latter indivisible, while in another sense they are relative as knowledge is to knowable, if plurality is number and the one is a measure.

7

Since contraries admit of an intermediate and in some cases have it, intermediates must be composed of the contraries. For (1) all intermediates are in the same genus as the things between which they stand. For we call those things intermediates, into which that which changes must change first; e.g. if we were to pass from the highest string to the lowest by the smallest intervals, we should come sooner to the intermediate notes, and in colours if we were to pass from white to black, we should come sooner to crimson and grey than to black; and similarly in all other cases. But to change from one genus to another genus is not possible except in an incidental way, as from colour to figure. Intermediates, then, must be in the same genus both as one another and as the things they stand between.

But (2) all intermediates stand between opposites of some kind; for only between these can change take place in virtue of their own nature (so that an intermediate is impossible between things which are not opposite; for then there would be change which was not from one opposite towards the other). Of opposites, contradictories admit of no middle term; for this is what contradiction is – an opposition, one or other side of

which must attach to anything whatever, i.e. which has no intermediate. Of other opposites, some are relative, others privative, others contrary. Of relative terms, those which are not contrary have no intermediate; the reason is that they are not in the same genus. For what intermediate could there be between knowledge and knowable? But between great and small there is one.

(3) If intermediates are in the same genus, as has been shown, and stand between contraries, they must be composed of these contraries. For either there will be a genus including the contraries or there will be none. And if (a) there is to be a genus in such a way that it is something prior to the contraries, the differentiae which constituted the contrary species-of-a-genus will be contraries prior to the species; for species are composed of the genus and the differentiae. (E.g. if white and black are contraries, and one is a piercing colour and the other a compressing colour, these differentiae – 'piercing' and 'compressing' – are prior; so that these are prior contraries of one another.) But, again, the species which differ contrariwise are the more truly contrary species. And the other.species, i.e. the intermediates, must be composed of their genus and their differentiae. (E.g. all colours which are between white and black must be said to be composed of the genus, i.e. colour, and certain differentiae. But these differentiae will not be the primary contraries; otherwise every colour would be either white or black. They are different, then, from the primary contraries; and therefore they will be between the primary contraries; the primary differentiae are 'piercing' and 'compressing'.)

Therefore it is (b) with regard to these contraries which do not fall within a genus that we must first ask of what their intermediates are composed. (For things which are in the same genus must be composed of terms in which the genus is not an

element, or else be themselves incomposite.) Now contraries do not involve one another in their composition, and are therefore first principles; but the intermediates are either all incomposite, or none of them. But there is something compounded out of the contraries, so that there can be a change from a contrary to it sooner than to the other contrary; for it will have less of the quality in question than the one contrary and more than the other. This also, then, will come between the contraries. All the other intermediates also, therefore, are composite; for that which has more of a quality than one thing and less than another is compounded somehow out of the things than which it is said to have more and less respectively of the quality. And since there are no other things prior to the contraries and homogeneous with the intermediates, all intermediates must be compounded out of the contraries. Therefore also all the inferior classes, both the contraries and their intermediates, will be compounded out of the primary contraries. Clearly, then, intermediates are (1) all in the same genus and (2) intermediate between contraries, and (3) all compounded out of the contraries.

8

That which is other in species is other than something in something, and this must belong to both; e.g. if it is an animal other in species, both are animals. The things, then, which are other in species must be in the same genus. For by genus I mean that one identical thing which is predicated of both and is differentiated in no merely accidental way, whether conceived as matter or otherwise. For not only must the common nature attach to the different things, e.g. not only must both be animals, but this very animality must also be different for each

(e.g. in the one case equinity, in the other humanity), and so this common nature is specifically different for each from what it is for the other. One, then, will be in virtue of its own nature one sort of animal, and the other another, e.g. one a horse and the other a man. This difference, then, must be an otherness of the genus. For I give the name of 'difference in the genus' an otherness which makes the genus itself other.

This, then, will be a contrariety (as can be shown also by induction). For all things are divided by opposites, and it has been proved that contraries are in the same genus. For contrariety was seen to be complete difference; and all difference in species is a difference from something in something; so that this is the same for both and is their genus. (Hence also all contraries which are different in species and not in genus are in the same line of predication, and other than one another in the highest degree – for the difference is complete – , and cannot be present along with one another.) The difference, then, is a contrariety.

This, then, is what it is to be 'other in species' – to have a contrariety, being in the same genus and being indivisible (and those things are the same in species which have no contrariety, being indivisible); we say 'being indivisible', for in the process of division contrarieties arise in the intermediate stages before we come to the indivisibles. Evidently, therefore, with reference to that which is called the genus, none of the species-of-a-genus is either the same as it or other than it in species (and this is fitting; for the matter is indicated by negation, and the genus is the matter of that of which it is called the genus, not in the sense in which we speak of the genus or family of the Heraclidae, but in that in which the genus is an element in a thing's nature), nor is it so with reference to things which are not in the same genus, but it will differ in genus from them, and in species from things in the same genus. For a thing's

difference from that from which it differs in species must be a contrariety; and this belongs only to things in the same genus.

9

One might raise the question, why woman does not differ from man in species, when female and male are contrary and their difference is a contrariety; and why a female and a male animal are not different in species, though this difference belongs to animal in virtue of its own nature, and not as paleness or darkness does; both 'female' and 'male' belong to it qua animal. This question is almost the same as the other, why one contrariety makes things different in species and another does not, e.g. 'with feet' and 'with wings' do, but paleness and darkness do not. Perhaps it is because the former are modifications peculiar to the genus, and the latter are less so. And since one element is definition and one is matter, contrarieties which are in the definition make a difference in species, but those which are in the thing taken as including its matter do not make one. And so paleness in a man, or darkness, does not make one, nor is there a difference in species between the pale man and the dark man, not even if each of them be denoted by one word. For man is here being considered on his material side, and matter does not create a difference; for it does not make individual men species of man, though the flesh and the bones of which this man and that man consist are other. The concrete thing is other, but not other in species, because in the definition there is no contrariety. This is the ultimate indivisible kind. Callias is definition + matter, the pale man, then, is so also, because it is the individual Callias that is pale; man, then, is pale only incidentally. Neither do a brazen and a wooden circle, then, differ in species; and if a brazen

triangle and a wooden circle differ in species, it is not because of the matter, but because there is a contrariety in the definition. But does the matter not make things other in species, when it is other in a certain way, or is there a sense in which it does? For why is this horse other than this man in species, although their matter is included with their definitions? Doubtless because there is a contrariety in the definition. For while there is a contrariety also between pale man and dark horse, and it is a contrariety in species, it does not depend on the paleness of the one and the darkness of the other, since even if both had been pale, yet they would have been other in species. But male and female, while they are modifications peculiar to 'animal', are so not in virtue of its essence but in the matter, ie. the body. This is why the same seed becomes female or male by being acted on in a certain way. We have stated, then, what it is to be other in species, and why some things differ in species and others do not.

10

Since contraries are other in form, and the perishable and the imperishable are contraries (for privation is a determinate incapacity), the perishable and the imperishable must be different in kind.

Now so far we have spoken of the general terms themselves, so that it might be thought not to be necessary that every imperishable thing should be different from every perishable thing in form, just as not every pale thing is different in form from every dark thing. For the same thing can be both, and even at the same time if it is a universal (e.g. man can be both pale and dark), and if it is an individual it can still be both; for the

same man can be, though not at the same time, pale and dark. Yet pale is contrary to dark.

But while some contraries belong to certain things by accident (e.g. both those now mentioned and many others), others cannot, and among these are 'perishable' and 'imperishable'. For nothing is by accident perishable. For what is accidental is capable of not being present, but perishableness is one of the attributes that belong of necessity to the things to which they belong; or else one and the same thing may be perishable and imperishable, if perishableness is capable of not belonging to it. Perishableness then must either be the essence or be present in the essence of each perishable thing. The same account holds good for imperishableness also; for both are attributes which are present of necessity. The characteristics, then, in respect of which and in direct consequence of which one thing is perishable and another imperishable, are opposite, so that the things must be different in kind.

Evidently, then, there cannot be Forms such as some maintain, for then one man would be perishable and another imperishable. Yet the Forms are said to be the same in form with the individuals and not merely to have the same name; but things which differ in kind are farther apart than those which differ in form.

Book K

1

That Wisdom is a science of first principles is evident from the introductory chapters, in which we have raised objections to the statements of others about the first principles; but one might ask the question whether Wisdom is to be conceived as one science or as several. If as one, it may be objected that one science always deals with contraries, but the first principles are not contrary. If it is not one, what sort of sciences are those with which it is to be identified?

Further, is it the business of one science, or of more than one, to examine the first principles of demonstration? If of one, why of this rather than of any other? If of more, what sort of sciences must these be said to be?

Further, does Wisdom investigate all substances or not? If not all, it is hard to say which; but if, being one, it investigates them all, it is doubtful how the same science can embrace several subject-matters.

Further, does it deal with substances only or also with their attributes? If in the case of attributes demonstration is possible, in that of substances it is not. But if the two sciences are different, what is each of them and which is Wisdom? If we think of it as demonstrative, the science of the attributes is Wisdom, but if as dealing with what is primary, the science of substances claims the tide.

But again the science we are looking for must not be supposed to deal with the causes which have been mentioned in the

Physics. For (A) it does not deal with the final cause (for that is the nature of the good, and this is found in the field of action and movement; and it is the first mover – for that is the nature of the end – but in the case of things unmovable there is nothing that moved them first), and (B) in general it is hard to say whether perchance the science we are now looking for deals with perceptible substances or not with them, but with certain others. If with others, it must deal either with the Forms or with the objects of mathematics. Now (a) evidently the Forms do not exist. (But it is hard to say, even if one suppose them to exist, why in the world the same is not true of the other things of which there are Forms, as of the objects of mathematics. I mean that these thinkers place the objects of mathematics between the Forms and perceptible things, as a kind of third set of things apart both from the Forms and from the things in this world; but there is not a third man or horse besides the ideal and the individuals. If on the other hand it is not as they say, with what sort of things must the mathematician be supposed to deal? Certainly not with the things in this world; for none of these is the sort of thing which the mathematical sciences demand.) Nor (b) does the science which we are now seeking treat of the objects of mathematics; for none of them can exist separately. But again it does not deal with perceptible substances; for they are perishable.

In general one might raise the question, to what kind of science it belongs to discuss the difficulties about the matter of the objects of mathematics. Neither to physics (because the whole inquiry of the physicist is about the things that have in themselves a principle. of movement and rest), nor yet to the science which inquires into demonstration and science; for this is just the subject which it investigates. It remains then that it is the philosophy which we have set before ourselves that treats of those subjects.

One might discuss the question whether the science we are seeking should be said to deal with the principles which are by some called elements; all men suppose these to be present in composite things. But it might be thought that the science we seek should treat rather of universals; for every definition and every science is of universals and not of infimae species, so that as far as this goes it would deal with the highest genera. These would turn out to be being and unity; for these might most of all be supposed to contain all things that are, and to be most like principles because they are by nature; for if they perish all other things are destroyed with them; for everything is and is one. But inasmuch as, if one is to suppose them to be genera, they must be predicable of their differentiae, and no genus is predicable of any of its differentiae, in this way it would seem that we should not make them genera nor principles. Further, if the simpler is more of a principle than the less simple, and the ultimate members of the genus are simpler than the genera (for they are indivisible, but the genera are divided into many and differing species), the species might seem to be the principles, rather than the genera. But inasmuch as the species are involved in the destruction of the genera, the genera are more like principles; for that which involves another in its destruction is a principle of it. These and others of the kind are the subjects that involve difficulties.

2

Further, must we suppose something apart from individual things, or is it these that the science we are seeking treats of? But these are infinite in number. Yet the things that are apart from the individuals are genera or species; but the science we now seek treats of neither of these. The reason why this is

impossible has been stated. Indeed, it is in general hard to say whether one must assume that there is a separable substance besides the sensible substances (i.e. the substances in this world), or that these are the real things and Wisdom is concerned with them. For we seem to seek another kind of substance, and this is our problem, i.e. to see if there is something which can exist apart by itself and belongs to no sensible thing. – Further, if there is another substance apart from and corresponding to sensible substances, which kinds of sensible substance must be supposed to have this corresponding to them? Why should one suppose men or horses to have it, more than either the other animals or even all lifeless things? On the other hand to set up other and eternal substances equal in number to the sensible and perishable substances would seem to fall beyond the bounds of probability. – But if the principle we now seek is not separable from corporeal things, what has a better claim to the name matter? This, however, does not exist in actuality, but exists in potency. And it would seem rather that the form or shape is a more important principle than this; but the form is perishable, so that there is no eternal substance at all which can exist apart and independent. But this is paradoxical; for such a principle and substance seems to exist and is sought by nearly all the most refined thinkers as something that exists; for how is there to be order unless there is something eternal and independent and permanent?

Further, if there is a substance or principle of such a nature as that which we are now seeking, and if this is one for all things, and the same for eternal and for perishable things, it is hard to say why in the world, if there is the same principle, some of the things that fall under the principle are eternal, and others are not eternal; this is paradoxical. But if there is one principle of perishable and another of eternal things, we shall be in a like difficulty if the principle of perishable things, as well as that of

eternal, is eternal; for why, if the principle is eternal, are not the things that fall under the principle also eternal? But if it is perishable another principle is involved to account for it, and another to account for that, and this will go on to infinity.

If on the other hand we are to set up what are thought to be the most unchangeable principles, being and unity, firstly, if each of these does not indicate a ‘this’ or substance, how will they be separable and independent? Yet we expect the eternal and primary principles to be so. But if each of them does signify a ‘this’ or substance, all things that are are substances; for being is predicated of all things (and unity also of some); but that all things that are are substance is false. Further, how can they be right who say that the first principle is unity and this is substance, and generate number as the first product from unity and from matter, assert that number is substance? How are we to think of ‘two’, and each of the other numbers composed of units, as one? On this point neither do they say anything nor is it easy to say anything. But if we are to suppose lines or what comes after these (I mean the primary surfaces) to be principles, these at least are not separable substances, but sections and divisions – the former of surfaces, the latter of bodies (while points are sections and divisions of lines); and further they are limits of these same things; and all these are in other things and none is separable. Further, how are we to suppose that there is a substance of unity and the point? Every substance comes into being by a gradual process, but a point does not; for the point is a division.

A further difficulty is raised by the fact that all knowledge is of universals and of the ‘such’, but substance is not a universal, but is rather a ‘this’ – a separable thing, so that if there is knowledge about the first principles, the question arises, how are we to suppose the first principle to be substance?

Further, is there anything apart from the concrete thing (by which I mean the matter and that which is joined with it), or not? If not, we are met by the objection that all things that are in matter are perishable. But if there is something, it must be the form or shape. Now it is hard to determine in which cases this exists apart and in which it does not; for in some cases the form is evidently not separable, e.g. in the case of a house.

Further, are the principles the same in kind or in number? If they are one in number, all things will be the same.

3

Since the science of the philosopher treats of being qua being universally and not in respect of a part of it, and 'being' has many senses and is not used in one only, it follows that if the word is used equivocally and in virtue of nothing common to its various uses, being does not fall under one science (for the meanings of an equivocal term do not form one genus); but if the word is used in virtue of something common, being will fall under one science. The term seems to be used in the way we have mentioned, like 'medical' and 'healthy'. For each of these also we use in many senses. Terms are used in this way by virtue of some kind of reference, in the one case to medical science, in the other to health, in others to something else, but in each case to one identical concept. For a discussion and a knife are called medical because the former proceeds from medical science, and the latter is useful to it. And a thing is called healthy in a similar way; one thing because it is indicative of health, another because it is productive of it. And the same is true in the other cases. Everything that is, then, is said to 'be' in this same way; each thing that is is said to 'be'

because it is a modification of being qua being or a permanent or a transient state or a movement of it, or something else of the sort. And since everything that is may be referred to something single and common, each of the contrarieties also may be referred to the first differences and contrarieties of being, whether the first differences of being are plurality and unity, or likeness and unlikeness, or some other differences; let these be taken as already discussed. It makes no difference whether that which is be referred to being or to unity. For even if they are not the same but different, at least they are convertible; for that which is one is also somehow being, and that which is being is one.

But since every pair of contraries falls to be examined by one and the same science, and in each pair one term is the privative of the other though one might regarding some contraries raise the question, how they can be privately related, viz. those which have an intermediate, e.g. unjust and just – in all such cases one must maintain that the privation is not of the whole definition, but of the infima species. if the just man is 'by virtue of some permanent disposition obedient to the laws', the unjust man will not in every case have the whole definition denied of him, but may be merely 'in some respect deficient in obedience to the laws', and in this respect the privation will attach to him; and similarly in all other cases.

As the mathematician investigates abstractions (for before beginning his investigation he strips off all the sensible qualities, e.g. weight and lightness, hardness and its contrary, and also heat and cold and the other sensible contrarieties, and leaves only the quantitative and continuous, sometimes in one, sometimes in two, sometimes in three dimensions, and the attributes of these qua quantitative and continuous, and does not consider them in any other respect, and examines the relative positions of some and the attributes of these, and the

commensurabilities and incommensurabilities of others, and the ratios of others; but yet we posit one and the same science of all these things – geometry) – the same is true with regard to being. For the attributes of this in so far as it is being, and the contrarieties in it qua being, it is the business of no other science than philosophy to investigate; for to physics one would assign the study of things not qua being, but rather qua sharing in movement; while dialectic and sophistic deal with the attributes of things that are, but not of things qua being, and not with being itself in so far as it is being; therefore it remains that it is the philosopher who studies the things we have named, in so far as they are being. Since all that is is to 'be' in virtue of something single and common, though the term has many meanings, and contraries are in the same case (for they are referred to the first contrarieties and differences of being), and things of this sort can fall under one science, the difficulty we stated at the beginning appears to be solved, – I mean the question how there can be a single science of things which are many and different in genus.

4

Since even the mathematician uses the common axioms only in a special application, it must be the business of first philosophy to examine the principles of mathematics also. That when equals are taken from equals the remainders are equal, is common to all quantities, but mathematics studies a part of its proper matter which it has detached, e.g. lines or angles or numbers or some other kind of quantity – not, however, qua being but in so far as each of them is continuous in one or two or three dimensions; but philosophy does not inquire about particular subjects in so far as each of them has some attribute

or other, but speculates about being, in so far as each particular thing is. – Physics is in the same position as mathematics; for physics studies the attributes and the principles of the things that are, qua moving and not qua being (whereas the primary science, we have said, deals with these, only in so far as the underlying subjects are existent, and not in virtue of any other character); and so both physics and mathematics must be classed as parts of Wisdom.

5

There is a principle in things, about which we cannot be deceived, but must always, on the contrary recognize the truth, – viz. that the same thing cannot at one and the same time be and not be, or admit any other similar pair of opposites. About such matters there is no proof in the full sense, though there is proof ad hominem. For it is not possible to infer this truth itself from a more certain principle, yet this is necessary if there is to be completed proof of it in the full sense. But he who wants to prove to the asserter of opposites that he is wrong must get from him an admission which shall be identical with the principle that the same thing cannot be and not be at one and the same time, but shall not seem to be identical; for thus alone can his thesis be demonstrated to the man who asserts that opposite statements can be truly made about the same subject. Those, then, who are to join in argument with one another must to some extent understand one another; for if this does not happen how are they to join in argument with one another? Therefore every word must be intelligible and indicate something, and not many things but only one; and if it signifies more than one thing, it must be made plain to which of these the word is being applied. He, then, who says 'this is and is not'

denies what he affirms, so that what the word signifies, he says it does not signify; and this is impossible. Therefore if 'this is' signifies something, one cannot truly assert its contradictory.

Further, if the word signifies something and this is asserted truly, this connexion must be necessary; and it is not possible that that which necessarily is should ever not be; it is not possible therefore to make the opposed affirmations and negations truly of the same subject. Further, if the affirmation is no more true than the negation, he who says 'man' will be no more right than he who says 'not-man'. It would seem also that in saying the man is not a horse one would be either more or not less right than in saying he is not a man, so that one will also be right in saying that the same person is a horse; for it was assumed to be possible to make opposite statements equally truly. It follows then that the same person is a man and a horse, or any other animal.

While, then, there is no proof of these things in the full sense, there is a proof which may suffice against one who will make these suppositions. And perhaps if one had questioned Heraclitus himself in this way one might have forced him to confess that opposite statements can never be true of the same subjects. But, as it is, he adopted this opinion without understanding what his statement involves. But in any case if what is said by him is true, not even this itself will be true – viz. that the same thing can at one and the same time both be and not be. For as, when the statements are separated, the affirmation is no more true than the negation, in the same way – the combined and complex statement being like a single affirmation – the whole taken as an affirmation will be no more true than the negation. Further, if it is not possible to affirm anything truly, this itself will be false – the assertion that there is no true affirmation. But if a true affirmation exists, this

appears to refute what is said by those who raise such objections and utterly destroy rational discourse.

6

The saying of Protagoras is like the views we have mentioned; he said that man is the measure of all things, meaning simply that that which seems to each man also assuredly is. If this is so, it follows that the same thing both is and is not, and is bad and good, and that the contents of all other opposite statements are true, because often a particular thing appears beautiful to some and the contrary of beautiful to others, and that which appears to each man is the measure. This difficulty may be solved by considering the source of this opinion. It seems to have arisen in some cases from the doctrine of the natural philosophers, and in others from the fact that all men have not the same views about the same things, but a particular thing appears pleasant to some and the contrary of pleasant to others.

That nothing comes to be out of that which is not, but everything out of that which is, is a dogma common to nearly all the natural philosophers. Since, then, white cannot come to be if the perfectly white and in no respect not-white existed before, that which becomes white must come from that which is not white; so that it must come to be out of that which is not (so they argue), unless the same thing was at the beginning white and not-white. But it is not hard to solve this difficulty; for we have said in our works on physics in what sense things that come to be come to be from that which is not, and in what sense from that which is.

But to attend equally to the opinions and the fancies of disputing parties is childish; for clearly one of them must be mistaken. And this is evident from what happens in respect of sensation; for the same thing never appears sweet to some and the contrary of sweet to others, unless in the one case the sense-organ which discriminates the aforesaid flavours has been perverted and injured. And if this is so the one party must be taken to be the measure, and the other must not. And say the same of good and bad, and beautiful and ugly, and all other such qualities. For to maintain the view we are opposing is just like maintaining that the things that appear to people who put their finger under their eye and make the object appear two instead of one must be two (because they appear to be of that number) and again one (for to those who do not interfere with their eye the one object appears one).

In general, it is absurd to make the fact that the things of this earth are observed to change and never to remain in the same state, the basis of our judgement about the truth. For in pursuing the truth one must start from the things that are always in the same state and suffer no change. Such are the heavenly bodies; for these do not appear to be now of one nature and again of another, but are manifestly always the same and share in no change.

Further, if there is movement, there is also something moved, and everything is moved out of something and into something; it follows that that that which is moved must first be in that out of which it is to be moved, and then not be in it, and move into the other and come to be in it, and that the contradictory statements are not true at the same time, as these thinkers assert they are.

And if the things of this earth continuously flow and move in respect of quantity – if one were to suppose this, although it is

not true – why should they not endure in respect of quality? For the assertion of contradictory statements about the same thing seems to have arisen largely from the belief that the quantity of bodies does not endure, which, our opponents hold, justifies them in saying that the same thing both is and is not four cubits long. But essence depends on quality, and this is of determinate nature, though quantity is of indeterminate.

Further, when the doctor orders people to take some particular food, why do they take it? In what respect is ‘this is bread’ truer than ‘this is not bread’? And so it would make no difference whether one ate or not. But as a matter of fact they take the food which is ordered, assuming that they know the truth about it and that it is bread. Yet they should not, if there were no fixed constant nature in sensible things, but all natures moved and flowed for ever.

Again, if we are always changing and never remain the same, what wonder is it if to us, as to the sick, things never appear the same? (For to them also, because they are not in the same condition as when they were well, sensible qualities do not appear alike; yet, for all that, the sensible things themselves need not share in any change, though they produce different, and not identical, sensations in the sick. And the same must surely happen to the healthy if the afore-said change takes place.) But if we do not change but remain the same, there will be something that endures.

As for those to whom the difficulties mentioned are suggested by reasoning, it is not easy to solve the difficulties to their satisfaction, unless they will posit something and no longer demand a reason for it; for it is only thus that all reasoning and all proof is accomplished; if they posit nothing, they destroy discussion and all reasoning. Therefore with such men there is no reasoning. But as for those who are perplexed by the

traditional difficulties, it is easy to meet them and to dissipate the causes of their perplexity. This is evident from what has been said.

It is manifest, therefore, from these arguments that contradictory statements cannot be truly made about the same subject at one time, nor can contrary statements, because every contrariety depends on privation. This is evident if we reduce the definitions of contraries to their principle.

Similarly, no intermediate between contraries can be predicated of one and the same subject, of which one of the contraries is predicated. If the subject is white we shall be wrong in saying it is neither black nor white, for then it follows that it is and is not white; for the second of the two terms we have put together is true of it, and this is the contradictory of white.

We could not be right, then, in accepting the views either of Heraclitus or of Anaxagoras. If we were, it would follow that contraries would be predicated of the same subject; for when Anaxagoras says that in everything there is a part of everything, he says nothing is sweet any more than it is bitter, and so with any other pair of contraries, since in everything everything is present not potentially only, but actually and separately. And similarly all statements cannot be false nor all true, both because of many other difficulties which might be adduced as arising from this position, and because if all are false it will not be true to say even this, and if all are true it will not be false to say all are false.

7

Every science seeks certain principles and causes for each of its objects – e.g. medicine and gymnastics and each of the other sciences, whether productive or mathematical. For each of these marks off a certain class of things for itself and busies itself about this as about something existing and real, – not however qua real; the science that does this is another distinct from these. Of the sciences mentioned each gets somehow the 'what' in some class of things and tries to prove the other truths, with more or less precision. Some get the 'what' through perception, others by hypothesis; so that it is clear from an induction of this sort that there is no demonstration. of the substance or 'what'.

There is a science of nature, and evidently it must be different both from practical and from productive science. For in the case of productive science the principle of movement is in the producer and not in the product, and is either an art or some other faculty. And similarly in practical science the movement is not in the thing done, but rather in the doers. But the science of the natural philosopher deals with the things that have in themselves a principle of movement. It is clear from these facts, then, that natural science must be neither practical nor productive, but theoretical (for it must fall into some one of these classes). And since each of the sciences must somehow know the 'what' and use this as a principle, we must not fall to observe how the natural philosopher should define things and how he should state the definition of the essence – whether as akin to 'snub' or rather to 'concave'. For of these the definition of 'snub' includes the matter of the thing, but that of 'concave' is independent of the matter; for snubness is found in a nose, so that we look for its definition without eliminating the nose, for what is snub is a concave nose. Evidently then the definition of

flesh also and of the eye and of the other parts must always be stated without eliminating the matter.

Since there is a science of being qua being and capable of existing apart, we must consider whether this is to be regarded as the same as physics or rather as different. Physics deals with the things that have a principle of movement in themselves; mathematics is theoretical, and is a science that deals with things that are at rest, but its subjects cannot exist apart. Therefore about that which can exist apart and is unmovable there is a science different from both of these, if there is a substance of this nature (I mean separable and unmovable), as we shall try to prove there is. And if there is such a kind of thing in the world, here must surely be the divine, and this must be the first and most dominant principle. Evidently, then, there are three kinds of theoretical sciences – physics, mathematics, theology. The class of theoretical sciences is the best, and of these themselves the last named is best; for it deals with the highest of existing things, and each science is called better or worse in virtue of its proper object.

One might raise the question whether the science of being qua being is to be regarded as universal or not. Each of the mathematical sciences deals with some one determinate class of things, but universal mathematics applies alike to all. Now if natural substances are the first of existing things, physics must be the first of sciences; but if there is another entity and substance, separable and unmovable, the knowledge of it must be different and prior to physics and universal because it is prior.

8

Since 'being' in general has several senses, of which one is 'being by accident', we must consider first that which 'is' in this sense. Evidently none of the traditional sciences busies itself about the accidental. For neither does architecture consider what will happen to those who are to use the house (e.g. whether they have a painful life in it or not), nor does weaving, or shoemaking, or the confectioner's art, do the like; but each of these sciences considers only what is peculiar to it, i.e. its proper end. And as for the argument that 'when he who is musical becomes lettered he'll be both at once, not having been both before; and that which is, not always having been, must have come to be; therefore he must have at once become musical and lettered', – this none of the recognized sciences considers, but only sophistic; for this alone busies itself about the accidental, so that Plato is not far wrong when he says that the sophist spends his time on non-being.

That a science of the accidental is not even possible will be evident if we try to see what the accidental really is. We say that everything either is always and of necessity (necessity not in the sense of violence, but that which we appeal to in demonstrations), or is for the most part, or is neither for the most part, nor always and of necessity, but merely as it chances; e.g. there might be cold in the dogdays, but this occurs neither always and of necessity, nor for the most part, though it might happen sometimes. The accidental, then, is what occurs, but not always nor of necessity, nor for the most part. Now we have said what the accidental is, and it is obvious why there is no science of such a thing; for all science is of that which is always or for the most part, but the accidental is in neither of these classes.

Evidently there are not causes and principles of the accidental, of the same kind as there are of the essential; for if there were,

everything would be of necessity. If A is when B is, and B is when C is, and if C exists not by chance but of necessity, that also of which C was cause will exist of necessity, down to the last causatum as it is called (but this was supposed to be accidental). Therefore all things will be of necessity, and chance and the possibility of a thing's either occurring or not occurring are removed entirely from the range of events. And if the cause be supposed not to exist but to be coming to be, the same results will follow; everything will occur of necessity. For to-morrow's eclipse will occur if A occurs, and A if B occurs, and B if C occurs; and in this way if we subtract time from the limited time between now and to-morrow we shall come sometime to the already existing condition. Therefore since this exists, everything after this will occur of necessity, so that all things occur of necessity.

As to that which 'is' in the sense of being true or of being by accident, the former depends on a combination in thought and is an affection of thought (which is the reason why it is the principles, not of that which 'is' in this sense, but of that which is outside and can exist apart, that are sought); and the latter is not necessary but indeterminate (I mean the accidental); and of such a thing the causes are unordered and indefinite.

Adaptation to an end is found in events that happen by nature or as the result of thought. It is 'luck' when one of these events happens by accident. For as a thing may exist, so it may be a cause, either by its own nature or by accident. Luck is an accidental cause at work in such events adapted to an end as are usually effected in accordance with purpose. And so luck and thought are concerned with the same sphere; for purpose cannot exist without thought. The causes from which lucky results might happen are indeterminate; and so luck is obscure to human calculation and is a cause by accident, but in the unqualified sense a cause of nothing. It is good or bad luck

when the result is good or evil; and prosperity or misfortune when the scale of the results is large.

Since nothing accidental is prior to the essential, neither are accidental causes prior. If, then, luck or spontaneity is a cause of the material universe, reason and nature are causes before it.

9

Some things are only actually, some potentially, some potentially and actually, what they are, viz. in one case a particular reality, in another, characterized by a particular quantity, or the like. There is no movement apart from things; for change is always according to the categories of being, and there is nothing common to these and in no one category. But each of the categories belongs to all its subjects in either of two ways (e.g. 'this-ness' – for one kind of it is 'positive form', and the other is 'privation'; and as regards quality one kind is 'white' and the other 'black', and as regards quantity one kind is 'complete' and the other 'incomplete', and as regards spatial movement one is 'upwards' and the other 'downwards', or one thing is 'light' and another 'heavy'); so that there are as many kinds of movement and change as of being. There being a distinction in each class of things between the potential and the completely real, I call the actuality of the potential as such, movement. That what we say is true, is plain from the following facts. When the 'buildable', in so far as it is what we mean by 'buildable', exists actually, it is being built, and this is the process of building. Similarly with learning, healing, walking, leaping, ageing, ripening. Movement takes when the complete reality itself exists, and neither earlier nor later. The complete reality, then, of that which exists potentially, when it is

completely real and actual, not qua itself, but qua movable, is movement. By qua I mean this: bronze is potentially a statue; but yet it is not the complete reality of bronze qua bronze that is movement. For it is not the same thing to be bronze and to be a certain potency. If it were absolutely the same in its definition, the complete reality of bronze would have been a movement. But it is not the same. (This is evident in the case of contraries; for to be capable of being well and to be capable of being ill are not the same – for if they were, being well and being ill would have been the same – it is that which underlies and is healthy or diseased, whether it is moisture or blood, that is one and the same.) And since it is not. the same, as colour and the visible are not the same, it is the complete reality of the potential, and as potential, that is movement. That it is this, and that movement takes place when the complete reality itself exists, and neither earlier nor later, is evident. For each thing is capable of being sometimes actual, sometimes not, e.g. the buildable qua buildable; and the actuality of the buildable qua buildable is building. For the actuality is either this – the act of building – or the house. But when the house exists, it is no longer buildable; the buildable is what is being built. The actuality, then, must be the act of building, and this is a movement. And the same account applies to all other movements.

That what we have said is right is evident from what all others say about movement, and from the fact that it is not easy to define it otherwise. For firstly one cannot put it in any class. This is evident from what people say. Some call it otherness and inequality and the unreal; none of these, however, is necessarily moved, and further, change is not either to these or from these any more than from their opposites. The reason why people put movement in these classes is that it is thought to be something indefinite, and the principles in one of the two 'columns of contraries' are indefinite because they are privative, for none of them is either a 'this' or a 'such' or in any of the other

categories. And the reason why movement is thought to be indefinite is that it cannot be classed either with the potency of things or with their actuality; for neither that which is capable of being of a certain quantity, nor that which is actually of a certain quantity, is of necessity moved, and movement is thought to be an actuality, but incomplete; the reason is that the potential, whose actuality it is, is incomplete. And therefore it is hard to grasp what movement is; for it must be classed either under privation or under potency or under absolute actuality, but evidently none of these is possible. Therefore what remains is that it must be what we said – both actuality and the actuality we have described – which is hard to detect but capable of existing.

And evidently movement is in the movable; for it is the complete realization of this by that which is capable of causing movement. And the actuality of that which is capable of causing movement is no other than that of the movable. For it must be the complete reality of both. For while a thing is capable of causing movement because it can do this, it is a mover because it is active; but it is on the movable that it is capable of acting, so that the actuality of both is one, just as there is the same interval from one to two as from two to one, and as the steep ascent and the steep descent are one, but the being of them is not one; the case of the mover and the moved is similar.

10

The infinite is either that which is incapable of being traversed because it is not its nature to be traversed (this corresponds to the sense in which the voice is 'invisible'), or that which admits only of incomplete traverse or scarcely admits of traverse, or

that which, though it naturally admits of traverse, is not traversed or limited; further, a thing may be infinite in respect of addition or of subtraction, or both. The infinite cannot be a separate, independent thing. For if it is neither a spatial magnitude nor a plurality, but infinity itself is its substance and not an accident of it, it will be indivisible; for the divisible is either magnitude or plurality. But if indivisible, it is not infinite, except as the voice is invisible; but people do not mean this, nor are we examining this sort of infinite, but the infinite as untraversable. Further, how can an infinite exist by itself, unless number and magnitude also exist by themselvess – since infinity is an attribute of these? Further, if the infinite is an accident of something else, it cannot be qua infinite an element in things, as the invisible is not an element in speech, though the voice is invisible. And evidently the infinite cannot exist actually. For then any part of it that might be taken would be infinite (for 'to be infinite' and 'the infinite' are the same, if the infinite is substance and not predicated of a subject). Therefore it is either indivisible, or if it is partible, it is divisible into infinites; but the same thing cannot be many infinites (as a part of air is air, so a part of the infinite would be infinite, if the infinite is substance and a principle). Therefore it must be impartible and indivisible. But the actually infinite cannot be indivisible; for it must be of a certain quantity. Therefore infinity belongs to its subject incidentally. But if so, then (as we have said) it cannot be it that is a principle, but that of which it is an accident – the air or the even number.

This inquiry is universal; but that the infinite is not among sensible things, is evident from the following argument. If the definition of a body is 'that which is bounded by planes', there cannot be an infinite body either sensible or intelligible; nor a separate and infinite number, for number or that which has a number is numerable. Concretely, the truth is evident from the following argument. The infinite can neither be composite nor

simple. For (a) it cannot be a composite body, since the elements are limited in multitude. For the contraries must be equal and no one of them must be infinite; for if one of the two bodies falls at all short of the other in potency, the finite will be destroyed by the infinite. And that each should be infinite is impossible. For body is that which has extension in all directions, and the infinite is the boundlessly extended, so that if the infinite is a body it will be infinite in every direction. Nor (b) can the infinite body be one and simple – neither, as some say, something apart from the elements, from which they generate these (for there is no such body apart from the elements; for everything can be resolved into that of which it consists, but no such product of analysis is observed except the simple bodies), nor fire nor any other of the elements. For apart from the question how any of them could be infinite, the All, even if it is finite, cannot either be or become any one of them, as Heraclitus says all things sometime become fire. The same argument applies to this as to the One which the natural philosophers posit besides the elements. For everything changes from contrary to contrary, e.g. from hot to cold.

Further, a sensible body is somewhere, and whole and part have the same proper place, e.g. the whole earth and part of the earth. Therefore if (a) the infinite body is homogeneous, it will be unmovable or it will be always moving. But this is impossible; for why should it rather rest, or move, down, up, or anywhere, rather than anywhere else? E.g. if there were a clod which were part of an infinite body, where will this move or rest? The proper place of the body which is homogeneous with it is infinite. Will the clod occupy the whole place, then? And how? (This is impossible.) What then is its rest or its movement? It will either rest everywhere, and then it cannot move; or it will move everywhere, and then it cannot be still. But (b) if the All has unlike parts, the proper places of the parts are unlike also, and, firstly, the body of the All is not one except by contact, and,

secondly, the parts will be either finite or infinite in variety of kind. Finite they cannot be; for then those of one kind will be infinite in quantity and those of another will not (if the All is infinite), e.g. fire or water would be infinite, but such an infinite element would be destruction to the contrary elements. But if the parts are infinite and simple, their places also are infinite and there will be an infinite number of elements; and if this is impossible, and the places are finite, the All also must be limited.

In general, there cannot be an infinite body and also a proper place for bodies, if every sensible body has either weight or lightness. For it must move either towards the middle or upwards, and the infinite either the whole or the half of it – cannot do either; for how will you divide it? Or how will part of the infinite be down and part up, or part extreme and part middle? Further, every sensible body is in a place, and there are six kinds of place, but these cannot exist in an infinite body. In general, if there cannot be an infinite place, there cannot be an infinite body; (and there cannot be an infinite place,) for that which is in a place is somewhere, and this means either up or down or in one of the other directions, and each of these is a limit.

The infinite is not the same in the sense that it is a single thing whether exhibited in distance or in movement or in time, but the posterior among these is called infinite in virtue of its relation to the prior; i.e. a movement is called infinite in virtue of the distance covered by the spatial movement or alteration or growth, and a time is called infinite because of the movement which occupies it.

11

Of things which change, some change in an accidental sense, like that in which 'the musical' may be said to walk, and others are said, without qualification, to change, because something in them changes, i.e. the things that change in parts; the body becomes healthy, because the eye does. But there is something which is by its own nature moved directly, and this is the essentially movable. The same distinction is found in the case of the mover; for it causes movement either in an accidental sense or in respect of a part of itself or essentially. There is something that directly causes movement; and there is something that is moved, also the time in which it is moved, and that from which and that into which it is moved. But the forms and the affections and the place, which are the terminals of the movement of moving things, are unmovable, e.g. knowledge or heat; it is not heat that is a movement, but heating. Change which is not accidental is found not in all things, but between contraries, and their intermediates, and between contradictories. We may convince ourselves of this by induction.

That which changes changes either from positive into positive, or from negative into negative, or from positive into negative, or from negative into positive. (By positive I mean that which is expressed by an affirmative term.) Therefore there must be three changes; that from negative into negative is not change, because (since the terms are neither contraries nor contradictories) there is no opposition. The change from the negative into the positive which is its contradictory is generation – absolute change absolute generation, and partial change partial generation; and the change from positive to negative is destruction – absolute change absolute destruction, and partial change partial destruction. If, then, 'that which is not' has several senses, and movement can attach neither to that which implies putting together or separating, nor to that

which implies potency and is opposed to that which is in the full sense (true, the not-white or not-good can be moved incidentally, for the not-white might be a man; but that which is not a particular thing at all can in no wise be moved), that which is not cannot be moved (and if this is so, generation cannot be movement; for that which is not is generated; for even if we admit to the full that its generation is accidental, yet it is true to say that 'not-being' is predicable of that which is generated absolutely). Similarly rest cannot be long to that which is not. These consequences, then, turn out to be awkward, and also this, that everything that is moved is in a place, but that which is not is not in a place; for then it would be somewhere. Nor is destruction movement; for the contrary of movement is rest, but the contrary of destruction is generation. Since every movement is a change, and the kinds of change are the three named above, and of these those in the way of generation and destruction are not movements, and these are the changes from a thing to its contradictory, it follows that only the change from positive into positive is movement. And the positives are either contrary or intermediate (for even privation must be regarded as contrary), and are expressed by an affirmative term, e.g. 'naked' or 'toothless' or 'black'.

12

If the categories are classified as substance, quality, place, acting or being acted on, relation, quantity, there must be three kinds of movement – of quality, of quantity, of place. There is no movement in respect of substance (because there is nothing contrary to substance), nor of relation (for it is possible that if one of two things in relation changes, the relative term which was true of the other thing ceases to be true, though this other

does not change at all, – so that their movement is accidental), nor of agent and patient, or mover and moved, because there is no movement of movement nor generation of generation, nor, in general, change of change. For there might be movement of movement in two senses; (1) movement might be the subject moved, as a man is moved because he changes from pale to dark, – so that on this showing movement, too, may be either heated or cooled or change its place or increase. But this is impossible; for change is not a subject. Or (2) some other subject might change from change into some other form of existence (e.g. a man from disease into health). But this also is not possible except incidentally. For every movement is change from something into something. (And so are generation and destruction; only, these are changes into things opposed in certain ways while the other, movement, is into things opposed in another way.) A thing changes, then, at the same time from health into illness, and from this change itself into another. Clearly, then, if it has become ill, it will have changed into whatever may be the other change concerned (though it may be at rest), and, further, into a determinate change each time; and that new change will be from something definite into some other definite thing; therefore it will be the opposite change, that of growing well. We answer that this happens only incidentally; e.g. there is a change from the process of recollection to that of forgetting, only because that to which the process attaches is changing, now into a state of knowledge, now into one of ignorance.

Further, the process will go on to infinity, if there is to be change of change and coming to be of coming to be. What is true of the later, then, must be true of the earlier; e.g. if the simple coming to be was once coming to be, that which comes to be something was also once coming to be; therefore that which simply comes to be something was not yet in existence, but something which was coming to be coming to be something was already in

existence. And this was once coming to be, so that at that time it was not yet coming to be something else. Now since of an infinite number of terms there is not a first, the first in this series will not exist, and therefore no following term exist. Nothing, then, can either come term wi to be or move or change. Further, that which is capable of a movement is also capable of the contrary movement and rest, and that which comes to be also ceases to be. Therefore that which is coming to be is ceasing to be when it has come to be coming to be; for it cannot cease to be as soon as it is coming to be coming to be, nor after it has come to be; for that which is ceasing to be must be. Further, there must be a matter underlying that which comes to be and changes. What will this be, then, – what is it that becomes movement or becoming, as body or soul is that which suffers alteration? And; again, what is it that they move into? For it must be the movement or becoming of something from something into something. How, then, can this condition be fulfilled? There can be no learning of learning, and therefore no becoming of becoming. Since there is not movement either of substance or of relation or of activity and passivity, it remains that movement is in respect of quality and quantity and place; for each of these admits of contrariety. By quality I mean not that which is in the substance (for even the differentia is a quality), but the passive quality, in virtue of which a thing is said to be acted on or to be incapable of being acted on. The immobile is either that which is wholly incapable of being moved, or that which is moved with difficulty in a long time or begins slowly, or that which is of a nature to be moved and can be moved but is not moved when and where and as it would naturally be moved. This alone among immobiles I describe as being at rest; for rest is contrary to movement, so that it must be a privation in that which is receptive of movement.

Things which are in one proximate place are together in place, and things which are in different places are apart: things whose

extremes are together touch: that at which a changing thing, if it changes continuously according to its nature, naturally arrives before it arrives at the extreme into which it is changing, is between. That which is most distant in a straight line is contrary in place. That is successive which is after the beginning (the order being determined by position or form or in some other way) and has nothing of the same class between it and that which it succeeds, e.g. lines in the case of a line, units in that of a unit, or a house in that of a house. (There is nothing to prevent a thing of some other class from being between.) For the successive succeeds something and is something later; 'one' does not succeed 'two', nor the first day of the month the second. That which, being successive, touches, is contiguous. (Since all change is between opposites, and these are either contraries or contradictories, and there is no middle term for contradictories, clearly that which is between is between contraries.) The continuous is a species of the contiguous. I call two things continuous when the limits of each, with which they touch and by which they are kept together, become one and the same, so that plainly the continuous is found in the things out of which a unity naturally arises in virtue of their contact. And plainly the successive is the first of these concepts (for the successive does not necessarily touch, but that which touches is successive; and if a thing is continuous, it touches, but if it touches, it is not necessarily continuous; and in things in which there is no touching, there is no organic unity); therefore a point is not the same as a unit; for contact belongs to points, but not to units, which have only succession; and there is something between two of the former, but not between two of the latter.

Book Λ

1

The subject of our inquiry is substance; for the principles and the causes we are seeking are those of substances. For if the universe is of the nature of a whole, substance is its first part; and if it coheres merely by virtue of serial succession, on this view also substance is first, and is succeeded by quality, and then by quantity. At the same time these latter are not even being in the full sense, but are qualities and movements of it, – or else even the not-white and the not-straight would be being; at least we say even these are, e.g. 'there is a not-white'. Further, none of the categories other than substance can exist apart. And the early philosophers also in practice testify to the primacy of substance; for it was of substance that they sought the principles and elements and causes. The thinkers of the present day tend to rank universals as substances (for genera are universals, and these they tend to describe as principles and substances, owing to the abstract nature of their inquiry); but the thinkers of old ranked particular things as substances, e.g. fire and earth, not what is common to both, body.

There are three kinds of substance – one that is sensible (of which one subdivision is eternal and another is perishable; the latter is recognized by all men, and includes e.g. plants and animals), of which we must grasp the elements, whether one or many; and another that is immovable, and this certain thinkers assert to be capable of existing apart, some dividing it into two, others identifying the Forms and the objects of mathematics, and others positing, of these two, only the objects of mathematics. The former two kinds of substance are the subject

of physics (for they imply movement); but the third kind belongs to another science, if there is no principle common to it and to the other kinds.

2

Sensible substance is changeable. Now if change proceeds from opposites or from intermediates, and not from all opposites (for the voice is not-white, but it does not therefore change to white), but from the contrary, there must be something underlying which changes into the contrary state; for the contraries do not change. Further, something persists, but the contrary does not persist; there is, then, some third thing besides the contraries, viz. the matter. Now since changes are of four kinds – either in respect of the 'what' or of the quality or of the quantity or of the place, and change in respect of 'thisness' is simple generation and destruction, and change in quantity is increase and diminution, and change in respect of an affection is alteration, and change of place is motion, changes will be from given states into those contrary to them in these several respects. The matter, then, which changes must be capable of both states. And since that which 'is' has two senses, we must say that everything changes from that which is potentially to that which is actually, e.g. from potentially white to actually white, and similarly in the case of increase and diminution. Therefore not only can a thing come to be, incidentally, out of that which is not, but also all things come to be out of that which is, but is potentially, and is not actually. And this is the 'One' of Anaxagoras; for instead of 'all things were together' – and the 'Mixture' of Empedocles and Anaximander and the account given by Democritus – it is better to say 'all things were together potentially but not actually'. Therefore these thinkers

seem to have had some notion of matter. Now all things that change have matter, but different matter; and of eternal things those which are not generable but are movable in space have matter – not matter for generation, however, but for motion from one place to another.

One might raise the question from what sort of non-being generation proceeds; for ‘non-being’ has three senses. If, then, one form of non-being exists potentially, still it is not by virtue of a potentiality for any and every thing, but different things come from different things; nor is it satisfactory to say that ‘all things were together’; for they differ in their matter, since otherwise why did an infinity of things come to be, and not one thing? For ‘reason’ is one, so that if matter also were one, that must have come to be in actuality which the matter was in potency. The causes and the principles, then, are three, two being the pair of contraries of which one is definition and form and the other is privation, and the third being the matter.

3

Note, next, that neither the matter nor the form comes to be – and I mean the last matter and form. For everything that changes is something and is changed by something and into something. That by which it is changed is the immediate mover; that which is changed, the matter; that into which it is changed, the form. The process, then, will go on to infinity, if not only the bronze comes to be round but also the round or the bronze comes to be; therefore there must be a stop.

Note, next, that each substance comes into being out of something that shares its name. (Natural objects and other things both rank as substances.) For things come into being

either by art or by nature or by luck or by spontaneity. Now art is a principle of movement in something other than the thing moved, nature is a principle in the thing itself (for man begets man), and the other causes are privations of these two.

There are three kinds of substance – the matter, which is a 'this' in appearance (for all things that are characterized by contact and not, by organic unity are matter and substratum, e.g. fire, flesh, head; for these are all matter, and the last matter is the matter of that which is in the full sense substance); the nature, which is a 'this' or positive state towards which movement takes place; and again, thirdly, the particular substance which is composed of these two, e.g. Socrates or Callias. Now in some cases the 'this' does not exist apart from the composite substance, e.g. the form of house does not so exist, unless the art of building exists apart (nor is there generation and destruction of these forms, but it is in another way that the house apart from its matter, and health, and all ideals of art, exist and do not exist); but if the 'this' exists apart from the concrete thing, it is only in the case of natural objects. And so Plato was not far wrong when he said that there are as many Forms as there are kinds of natural object (if there are Forms distinct from the things of this earth). The moving causes exist as things preceding the effects, but causes in the sense of definitions are simultaneous with their effects. For when a man is healthy, then health also exists; and the shape of a bronze sphere exists at the same time as the bronze sphere. (But we must examine whether any form also survives afterwards. For in some cases there is nothing to prevent this; e.g. the soul may be of this sort – not all soul but the reason; for presumably it is impossible that all soul should survive.) Evidently then there is no necessity, on this ground at least, for the existence of the Ideas. For man is begotten by man, a given man by an individual father; and similarly in the arts; for the medical art is the formal cause of health.

4

The causes and the principles of different things are in a sense different, but in a sense, if one speaks universally and analogically, they are the same for all. For one might raise the question whether the principles and elements are different or the same for substances and for relative terms, and similarly in the case of each of the categories. But it would be paradoxical if they were the same for all. For then from the same elements will proceed relative terms and substances. What then will this common element be? For (1) (a) there is nothing common to and distinct from substance and the other categories, viz. those which are predicated; but an element is prior to the things of which it is an element. But again (b) substance is not an element in relative terms, nor is any of these an element in substance. Further, (2) how can all things have the same elements? For none of the elements can be the same as that which is composed of elements, e.g. b or a cannot be the same as ba. (None, therefore, of the intelligibles, e.g. being or unity, is an element; for these are predicable of each of the compounds as well.) None of the elements, then, will be either a substance or a relative term; but it must be one or other. All things, then, have not the same elements.

Or, as we are wont to put it, in a sense they have and in a sense they have not; e.g. perhaps the elements of perceptible bodies are, as form, the hot, and in another sense the cold, which is the privation; and, as matter, that which directly and of itself potentially has these attributes; and substances comprise both these and the things composed of these, of which these are the principles, or any unity which is produced out of the hot and the cold, e.g. flesh or bone; for the product must be different

from the elements. These things then have the same elements and principles (though specifically different things have specifically different elements); but all things have not the same elements in this sense, but only analogically; i.e. one might say that there are three principles – the form, the privation, and the matter. But each of these is different for each class; e.g. in colour they are white, black, and surface, and in day and night they are light, darkness, and air.

Since not only the elements present in a thing are causes, but also something external, i.e. the moving cause, clearly while ‘principle’ and ‘element’ are different both are causes, and ‘principle’ is divided into these two kinds; and that which acts as producing movement or rest is a principle and a substance. Therefore analogically there are three elements, and four causes and principles; but the elements are different in different things, and the proximate moving cause is different for different things. Health, disease, body; the moving cause is the medical art. Form, disorder of a particular kind, bricks; the moving cause is the building art. And since the moving cause in the case of natural things is – for man, for instance, man, and in the products of thought the form or its contrary, there will be in a sense three causes, while in a sense there are four. For the medical art is in some sense health, and the building art is the form of the house, and man begets man; further, besides these there is that which as first of all things moves all things.

5

Some things can exist apart and some cannot, and it is the former that are substances. And therefore all things have the same causes, because, without substances, modifications and

movements do not exist. Further, these causes will probably be soul and body, or reason and desire and body.

And in yet another way, analogically identical things are principles, i.e. actuality and potency; but these also are not only different for different things but also apply in different ways to them. For in some cases the same thing exists at one time actually and at another potentially, e.g. wine or flesh or man does so. (And these too fall under the above-named causes. For the form exists actually, if it can exist apart, and so does the complex of form and matter, and the privation, e.g. darkness or disease; but the matter exists potentially; for this is that which can become qualified either by the form or by the privation.) But the distinction of actuality and potentiality applies in another way to cases where the matter of cause and of effect is not the same, in some of which cases the form is not the same but different; e.g. the cause of man is (1) the elements in man (viz. fire and earth as matter, and the peculiar form), and further (2) something else outside, i.e. the father, and (3) besides these the sun and its oblique course, which are neither matter nor form nor privation of man nor of the same species with him, but moving causes.

Further, one must observe that some causes can be expressed in universal terms, and some cannot. The proximate principles of all things are the 'this' which is proximate in actuality, and another which is proximate in potentiality. The universal causes, then, of which we spoke do not exist. For it is the individual that is the originative principle of the individuals. For while man is the originative principle of man universally, there is no universal man, but Peleus is the originative principle of Achilles, and your father of you, and this particular b of this particular ba, though b in general is the originative principle of ba taken without qualification.

Further, if the causes of substances are the causes of all things, yet different things have different causes and elements, as was said; the causes of things that are not in the same class, e.g. of colours and sounds, of substances and quantities, are different except in an analogical sense; and those of things in the same species are different, not in species, but in the sense that the causes of different individuals are different, your matter and form and moving cause being different from mine, while in their universal definition they are the same. And if we inquire what are the principles or elements of substances and relations and qualities – whether they are the same or different – clearly when the names of the causes are used in several senses the causes of each are the same, but when the senses are distinguished the causes are not the same but different, except that in the following senses the causes of all are the same. They are (1) the same or analogous in this sense, that matter, form, privation, and the moving cause are common to all things; and (2) the causes of substances may be treated as causes of all things in this sense, that when substances are removed all things are removed; further, (3) that which is first in respect of complete reality is the cause of all things. But in another sense there are different first causes, viz. all the contraries which are neither generic nor ambiguous terms; and, further, the matters of different things are different. We have stated, then, what are the principles of sensible things and how many they are, and in what sense they are the same and in what sense different.

6

Since there were three kinds of substance, two of them physical and one unmovable, regarding the latter we must assert that it is necessary that there should be an eternal unmovable

substance. For substances are the first of existing things, and if they are all destructible, all things are destructible. But it is impossible that movement should either have come into being or cease to be (for it must always have existed), or that time should. For there could not be a before and an after if time did not exist. Movement also is continuous, then, in the sense in which time is; for time is either the same thing as movement or an attribute of movement. And there is no continuous movement except movement in place, and of this only that which is circular is continuous.

But if there is something which is capable of moving things or acting on them, but is not actually doing so, there will not necessarily be movement; for that which has a potency need not exercise it. Nothing, then, is gained even if we suppose eternal substances, as the believers in the Forms do, unless there is to be in them some principle which can cause change; nay, even this is not enough, nor is another substance besides the Forms enough; for if it is not to act, there will be no movement. Further even if it acts, this will not be enough, if its essence is potency; for there will not be eternal movement, since that which is potentially may possibly not be. There must, then, be such a principle, whose very essence is actuality. Further, then, these substances must be without matter; for they must be eternal, if anything is eternal. Therefore they must be actuality.

Yet there is a difficulty; for it is thought that everything that acts is able to act, but that not everything that is able to act acts, so that the potency is prior. But if this is so, nothing that is need be; for it is possible for all things to be capable of existing but not yet to exist.

Yet if we follow the theologians who generate the world from night, or the natural philosophers who say that 'all things were

together', the same impossible result ensues. For how will there be movement, if there is no actually existing cause? Wood will surely not move itself – the carpenter's art must act on it; nor will the menstrual blood nor the earth set themselves in motion, but the seeds must act on the earth and the semen on the menstrual blood.

This is why some suppose eternal actuality – e.g. Leucippus and Plato; for they say there is always movement. But why and what this movement is they do say, nor, if the world moves in this way or that, do they tell us the cause of its doing so. Now nothing is moved at random, but there must always be something present to move it; e.g. as a matter of fact a thing moves in one way by nature, and in another by force or through the influence of reason or something else. (Further, what sort of movement is primary? This makes a vast difference.) But again for Plato, at least, it is not permissible to name here that which he sometimes supposes to be the source of movement – that which moves itself; for the soul is later, and coeval with the heavens, according to his account. To suppose potency prior to actuality, then, is in a sense right, and in a sense not; and we have specified these senses. That actuality is prior is testified by Anaxagoras (for his 'reason' is actuality) and by Empedocles in his doctrine of love and strife, and by those who say that there is always movement, e.g. Leucippus. Therefore chaos or night did not exist for an infinite time, but the same things have always existed (either passing through a cycle of changes or obeying some other law), since actuality is prior to potency. If, then, there is a constant cycle, something must always remain, acting in the same way. And if there is to be generation and destruction, there must be something else which is always acting in different ways. This must, then, act in one way in virtue of itself, and in another in virtue of something else – either of a third agent, therefore, or of the first. Now it must be in virtue of the first. For otherwise this again causes the motion

both of the second agent and of the third. Therefore it is better to say 'the first'. For it was the cause of eternal uniformity; and something else is the cause of variety, and evidently both together are the cause of eternal variety. This, accordingly, is the character which the motions actually exhibit. What need then is there to seek for other principles?

7

Since (1) this is a possible account of the matter, and (2) if it were not true, the world would have proceeded out of night and 'all things together' and out of non-being, these difficulties may be taken as solved. There is, then, something which is always moved with an unceasing motion, which is motion in a circle; and this is plain not in theory only but in fact. Therefore the first heaven must be eternal. There is therefore also something which moves it. And since that which moves and is moved is intermediate, there is something which moves without being moved, being eternal, substance, and actuality. And the object of desire and the object of thought move in this way; they move without being moved. The primary objects of desire and of thought are the same. For the apparent good is the object of appetite, and the real good is the primary object of rational wish. But desire is consequent on opinion rather than opinion on desire; for the thinking is the starting-point. And thought is moved by the object of thought, and one of the two columns of opposites is in itself the object of thought; and in this, substance is first, and in substance, that which is simple and exists actually. (The one and the simple are not the same; for 'one' means a measure, but 'simple' means that the thing itself has a certain nature.) But the beautiful, also, and that which is

in itself desirable are in the same column; and the first in any class is always best, or analogous to the best.

That a final cause may exist among unchangeable entities is shown by the distinction of its meanings. For the final cause is (a) some being for whose good an action is done, and (b) something at which the action aims; and of these the latter exists among unchangeable entities though the former does not. The final cause, then, produces motion as being loved, but all other things move by being moved. Now if something is moved it is capable of being otherwise than as it is. Therefore if its actuality is the primary form of spatial motion, then in so far as it is subject to change, in this respect it is capable of being otherwise, – in place, even if not in substance. But since there is something which moves while itself unmoved, existing actually, this can in no way be otherwise than as it is. For motion in space is the first of the kinds of change, and motion in a circle the first kind of spatial motion; and this the first mover produces. The first mover, then, exists of necessity; and in so far as it exists by necessity, its mode of being is good, and it is in this sense a first principle. For the necessary has all these senses – that which is necessary perforce because it is contrary to the natural impulse, that without which the good is impossible, and that which cannot be otherwise but can exist only in a single way.

On such a principle, then, depend the heavens and the world of nature. And it is a life such as the best which we enjoy, and enjoy for but a short time (for it is ever in this state, which we cannot be), since its actuality is also pleasure. (And for this reason are waking, perception, and thinking most pleasant, and hopes and memories are so on account of these.) And thinking in itself deals with that which is best in itself, and that which is thinking in the fullest sense with that which is best in the fullest sense. And thought thinks on itself because it shares the

nature of the object of thought; for it becomes an object of thought in coming into contact with and thinking its objects, so that thought and object of thought are the same. For that which is capable of receiving the object of thought, i.e. the essence, is thought. But it is active when it possesses this object. Therefore the possession rather than the receptivity is the divine element which thought seems to contain, and the act of contemplation is what is most pleasant and best. If, then, God is always in that good state in which we sometimes are, this compels our wonder; and if in a better this compels it yet more. And God is in a better state. And life also belongs to God; for the actuality of thought is life, and God is that actuality; and God's self-dependent actuality is life most good and eternal. We say therefore that God is a living being, eternal, most good, so that life and duration continuous and eternal belong to God; for this is God.

Those who suppose, as the Pythagoreans and Speusippus do, that supreme beauty and goodness are not present in the beginning, because the beginnings both of plants and of animals are causes, but beauty and completeness are in the effects of these, are wrong in their opinion. For the seed comes from other individuals which are prior and complete, and the first thing is not seed but the complete being; e.g. we must say that before the seed there is a man, – not the man produced from the seed, but another from whom the seed comes.

It is clear then from what has been said that there is a substance which is eternal and unmovable and separate from sensible things. It has been shown also that this substance cannot have any magnitude, but is without parts and indivisible (for it produces movement through infinite time, but nothing finite has infinite power; and, while every magnitude is either infinite or finite, it cannot, for the above reason, have finite magnitude, and it cannot have infinite magnitude because there

is no infinite magnitude at all). But it has also been shown that it is impassive and unalterable; for all the other changes are posterior to change of place.

8

It is clear, then, why these things are as they are. But we must not ignore the question whether we have to suppose one such substance or more than one, and if the latter, how many; we must also mention, regarding the opinions expressed by others, that they have said nothing about the number of the substances that can even be clearly stated. For the theory of Ideas has no special discussion of the subject; for those who speak of Ideas say the Ideas are numbers, and they speak of numbers now as unlimited, now as limited by the number 10; but as for the reason why there should be just so many numbers, nothing is said with any demonstrative exactness. We however must discuss the subject, starting from the presuppositions and distinctions we have mentioned. The first principle or primary being is not movable either in itself or accidentally, but produces the primary eternal and single movement. But since that which is moved must be moved by something, and the first mover must be in itself unmovable, and eternal movement must be produced by something eternal and a single movement by a single thing, and since we see that besides the simple spatial movement of the universe, which we say the first and unmovable substance produces, there are other spatial movements – those of the planets – which are eternal (for a body which moves in a circle is eternal and unresting; we have proved these points in the physical treatises), each of these movements also must be caused by a substance both unmovable in itself and eternal. For the nature of the stars is

eternal just because it is a certain kind of substance, and the mover is eternal and prior to the moved, and that which is prior to a substance must be a substance. Evidently, then, there must be substances which are of the same number as the movements of the stars, and in their nature eternal, and in themselves unmovable, and without magnitude, for the reason before mentioned. That the movers are substances, then, and that one of these is first and another second according to the same order as the movements of the stars, is evident. But in the number of the movements we reach a problem which must be treated from the standpoint of that one of the mathematical sciences which is most akin to philosophy – viz. of astronomy; for this science speculates about substance which is perceptible but eternal, but the other mathematical sciences, i.e. arithmetic and geometry, treat of no substance. That the movements are more numerous than the bodies that are moved is evident to those who have given even moderate attention to the matter; for each of the planets has more than one movement. But as to the actual number of these movements, we now – to give some notion of the subject – quote what some of the mathematicians say, that our thought may have some definite number to grasp; but, for the rest, we must partly investigate for ourselves, Partly learn from other investigators, and if those who study this subject form an opinion contrary to what we have now stated, we must esteem both parties indeed, but follow the more accurate.

Eudoxus supposed that the motion of the sun or of the moon involves, in either case, three spheres, of which the first is the sphere of the fixed stars, and the second moves in the circle which runs along the middle of the zodiac, and the third in the circle which is inclined across the breadth of the zodiac; but the circle in which the moon moves is inclined at a greater angle than that in which the sun moves. And the motion of the planets involves, in each case, four spheres, and of these also the first and second are the same as the first two mentioned

above (for the sphere of the fixed stars is that which moves all the other spheres, and that which is placed beneath this and has its movement in the circle which bisects the zodiac is common to all), but the poles of the third sphere of each planet are in the circle which bisects the zodiac, and the motion of the fourth sphere is in the circle which is inclined at an angle to the equator of the third sphere; and the poles of the third sphere are different for each of the other planets, but those of Venus and Mercury are the same.

Callippus made the position of the spheres the same as Eudoxus did, but while he assigned the same number as Eudoxus did to Jupiter and to Saturn, he thought two more spheres should be added to the sun and two to the moon, if one is to explain the observed facts; and one more to each of the other planets.

But it is necessary, if all the spheres combined are to explain the observed facts, that for each of the planets there should be other spheres (one fewer than those hitherto assigned) which counteract those already mentioned and bring back to the same position the outermost sphere of the star which in each case is situated below the star in question; for only thus can all the forces at work produce the observed motion of the planets. Since, then, the spheres involved in the movement of the planets themselves are – eight for Saturn and Jupiter and twenty-five for the others, and of these only those involved in the movement of the lowest-situated planet need not be counteracted the spheres which counteract those of the outermost two planets will be six in number, and the spheres which counteract those of the next four planets will be sixteen; therefore the number of all the spheres – both those which move the planets and those which counteract these – will be fifty-five. And if one were not to add to the moon and to the sun

the movements we mentioned, the whole set of spheres will be forty-seven in number.

Let this, then, be taken as the number of the spheres, so that the unmovable substances and principles also may probably be taken as just so many; the assertion of necessity must be left to more powerful thinkers. But if there can be no spatial movement which does not conduce to the moving of a star, and if further every being and every substance which is immune from change and in virtue of itself has attained to the best must be considered an end, there can be no other being apart from these we have named, but this must be the number of the substances. For if there are others, they will cause change as being a final cause of movement; but there cannot he other movements besides those mentioned. And it is reasonable to infer this from a consideration of the bodies that are moved; for if everything that moves is for the sake of that which is moved, and every movement belongs to something that is moved, no movement can be for the sake of itself or of another movement, but all the movements must be for the sake of the stars. For if there is to be a movement for the sake of a movement, this latter also will have to be for the sake of something else; so that since there cannot be an infinite regress, the end of every movement will be one of the divine bodies which move through the heaven.

(Evidently there is but one heaven. For if there are many heavens as there are many men, the moving principles, of which each heaven will have one, will be one in form but in number many. But all things that are many in number have matter; for one and the same definition, e.g. that of man, applies to many things, while Socrates is one. But the primary essence has not matter; for it is complete reality. So the unmovable first mover is one both in definition and in number; so too, therefore, is that which is moved always and

continuously; therefore there is one heaven alone.) Our forefathers in the most remote ages have handed down to their posterity a tradition, in the form of a myth, that these bodies are gods, and that the divine encloses the whole of nature. The rest of the tradition has been added later in mythical form with a view to the persuasion of the multitude and to its legal and utilitarian expediency; they say these gods are in the form of men or like some of the other animals, and they say other things consequent on and similar to these which we have mentioned. But if one were to separate the first point from these additions and take it alone – that they thought the first substances to be gods, one must regard this as an inspired utterance, and reflect that, while probably each art and each science has often been developed as far as possible and has again perished, these opinions, with others, have been preserved until the present like relics of the ancient treasure. Only thus far, then, is the opinion of our ancestors and of our earliest predecessors clear to us.

9

The nature of the divine thought involves certain problems; for while thought is held to be the most divine of things observed by us, the question how it must be situated in order to have that character involves difficulties. For if it thinks of nothing, what is there here of dignity? It is just like one who sleeps. And if it thinks, but this depends on something else, then (since that which is its substance is not the act of thinking, but a potency) it cannot be the best substance; for it is through thinking that its value belongs to it. Further, whether its substance is the faculty of thought or the act of thinking, what does it think of? Either of itself or of something else; and if of something else,

either of the same thing always or of something different. Does it matter, then, or not, whether it thinks of the good or of any chance thing? Are there not some things about which it is incredible that it should think? Evidently, then, it thinks of that which is most divine and precious, and it does not change; for change would be change for the worse, and this would be already a movement. First, then, if 'thought' is not the act of thinking but a potency, it would be reasonable to suppose that the continuity of its thinking is wearisome to it. Secondly, there would evidently be something else more precious than thought, viz. that which is thought of. For both thinking and the act of thought will belong even to one who thinks of the worst thing in the world, so that if this ought to be avoided (and it ought, for there are even some things which it is better not to see than to see), the act of thinking cannot be the best of things. Therefore it must be of itself that the divine thought thinks (since it is the most excellent of things), and its thinking is a thinking on thinking.

But evidently knowledge and perception and opinion and understanding have always something else as their object, and themselves only by the way. Further, if thinking and being thought of are different, in respect of which does goodness belong to thought? For to he an act of thinking and to he an object of thought are not the same thing. We answer that in some cases the knowledge is the object. In the productive sciences it is the substance or essence of the object, matter omitted, and in the theoretical sciences the definition or the act of thinking is the object. Since, then, thought and the object of thought are not different in the case of things that have not matter, the divine thought and its object will be the same, i.e. the thinking will be one with the object of its thought.

A further question is left – whether the object of the divine thought is composite; for if it were, thought would change in

passing from part to part of the whole. We answer that everything which has not matter is indivisible – as human thought, or rather the thought of composite beings, is in a certain period of time (for it does not possess the good at this moment or at that, but its best, being something different from it, is attained only in a whole period of time), so throughout eternity is the thought which has itself for its object.

10

We must consider also in which of two ways the nature of the universe contains the good, and the highest good, whether as something separate and by itself, or as the order of the parts. Probably in both ways, as an army does; for its good is found both in its order and in its leader, and more in the latter; for he does not depend on the order but it depends on him. And all things are ordered together somehow, but not all alike, – both fishes and fowls and plants; and the world is not such that one thing has nothing to do with another, but they are connected. For all are ordered together to one end, but it is as in a house, where the freemen are least at liberty to act at random, but all things or most things are already ordained for them, while the slaves and the animals do little for the common good, and for the most part live at random; for this is the sort of principle that constitutes the nature of each. I mean, for instance, that all must at least come to be dissolved into their elements, and there are other functions similarly in which all share for the good of the whole.

We must not fail to observe how many impossible or paradoxical results confront those who hold different views from our own, and what are the views of the subtler thinkers,

and which views are attended by fewest difficulties. All make all things out of contraries. But neither ‘all things’ nor ‘out of contraries’ is right; nor do these thinkers tell us how all the things in which the contraries are present can be made out of the contraries; for contraries are not affected by one another. Now for us this difficulty is solved naturally by the fact that there is a third element. These thinkers however make one of the two contraries matter; this is done for instance by those who make the unequal matter for the equal, or the many matter for the one. But this also is refuted in the same way; for the one matter which underlies any pair of contraries is contrary to nothing. Further, all things, except the one, will, on the view we are criticizing, partake of evil; for the bad itself is one of the two elements. But the other school does not treat the good and the bad even as principles; yet in all things the good is in the highest degree a principle. The school we first mentioned is right in saying that it is a principle, but how the good is a principle they do not say –whether as end or as mover or as form.

Empedocles also has a paradoxical view; for he identifies the good with love, but this is a principle both as mover (for it brings things together) and as matter (for it is part of the mixture). Now even if it happens that the same thing is a principle both as matter and as mover, still the being, at least, of the two is not the same. In which respect then is love a principle? It is paradoxical also that strife should be imperishable; the nature of his ‘evil’ is just strife.

Anaxagoras makes the good a motive principle; for his ‘reason’ moves things. But it moves them for an end, which must be something other than it, except according to our way of stating the case; for, on our view, the medical art is in a sense health. It is paradoxical also not to suppose a contrary to the good, i.e. to reason. But all who speak of the contraries make no use of the

contraries, unless we bring their views into shape. And why some things are perishable and others imperishable, no one tells us; for they make all existing things out of the same principles. Further, some make existing things out of the nonexistent; and others to avoid the necessity of this make all things one.

Further, why should there always be becoming, and what is the cause of becoming? – This no one tells us. And those who suppose two principles must suppose another, a superior principle, and so must those who believe in the Forms; for why did things come to participate, or why do they participate, in the Forms? And all other thinkers are confronted by the necessary consequence that there is something contrary to Wisdom, i.e. to the highest knowledge; but we are not. For there is nothing contrary to that which is primary; for all contraries have matter, and things that have matter exist only potentially; and the ignorance which is contrary to any knowledge leads to an object contrary to the object of the knowledge; but what is primary has no contrary.

Again, if besides sensible things no others exist, there will be no first principle, no order, no becoming, no heavenly bodies, but each principle will have a principle before it, as in the accounts of the theologians and all the natural philosophers. But if the Forms or the numbers are to exist, they will be causes of nothing; or if not that, at least not of movement. Further, how is extension, i.e. a continuum, to be produced out of unextended parts? For number will not, either as mover or as form, produce a continuum. But again there cannot be any contrary that is also essentially a productive or moving principle; for it would be possible for it not to be. Or at least its action would be posterior to its potency. The world, then, would not be eternal. But it is; one of these premisses, then, must be denied. And we have said how this must be done. Further, in virtue of what the numbers,

or the soul and the body, or in general the form and the thing, are one – of this no one tells us anything; nor can any one tell, unless he says, as we do, that the mover makes them one. And those who say mathematical number is first and go on to generate one kind of substance after another and give different principles for each, make the substance of the universe a mere series of episodes (for one substance has no influence on another by its existence or nonexistence), and they give us many governing principles; but the world refuses to be governed badly.

'The rule of many is not good; one ruler let there be.'

Book M

1

We have stated what is the substance of sensible things, dealing in the treatise on physics with matter, and later with the substance which has actual existence. Now since our inquiry is whether there is or is not besides the sensible substances any which is immovable and eternal, and, if there is, what it is, we must first consider what is said by others, so that, if there is anything which they say wrongly, we may not be liable to the same objections, while, if there is any opinion common to them and us, we shall have no private grievance against ourselves on that account; for one must be content to state some points better than one's predecessors, and others no worse.

Two opinions are held on this subject; it is said that the objects of mathematics – i.e. numbers and lines and the like – are substances, and again that the Ideas are substances. And (1) since some recognize these as two different classes – the Ideas and the mathematical numbers, and (2) some recognize both as having one nature, while (3) some others say that the mathematical substances are the only substances, we must consider first the objects of mathematics, not qualifying them by any other characteristic – not asking, for instance, whether they are in fact Ideas or not, or whether they are the principles and substances of existing things or not, but only whether as objects of mathematics they exist or not, and if they exist, how they exist. Then after this we must separately consider the Ideas themselves in a general way, and only as far as the accepted mode of treatment demands; for most of the points have been repeatedly made even by the discussions outside our school, and, further, the greater part of our account must finish by throwing light on that inquiry, viz. when we examine whether the substances and the principles of existing things are numbers and Ideas; for after the discussion of the Ideas this remans as a third inquiry.

If the objects of mathematics exist, they must exist either in sensible objects, as some say, or separate from sensible objects (and this also is said by some); or if they exist in neither of these ways, either they do not exist, or they exist only in some special sense. So that the subject of our discussion will be not whether they exist but how they exist.

2

That it is impossible for mathematical objects to exist in sensible things, and at the same time that the doctrine in question is an artificial one, has been said already in our discussion of difficulties we have pointed out that it is impossible for two solids to be in the same place, and also that according to the same argument the other powers and characteristics also should exist in sensible things and none of them separately. This we have said already. But, further, it is obvious that on this theory it is impossible for any body whatever to be divided; for it would have to be divided at a plane, and the plane at a line, and the line at a point, so that if the point cannot be divided, neither can the line, and if the line cannot, neither can the plane nor the solid. What difference, then, does it make whether sensible things are such indivisible entities, or, without being so themselves, have indivisible entities in them? The result will be the same; if the sensible entities are divided the others will be divided too, or else not even the sensible entities can be divided.

But, again, it is not possible that such entities should exist separately. For if besides the sensible solids there are to be other solids which are separate from them and prior to the sensible solids, it is plain that besides the planes also there must be other and separate planes and points and lines; for consistency requires this. But if these exist, again besides the planes and lines and points of the mathematical solid there must be others which are separate. (For incomposites are prior to compounds; and if there are, prior to the sensible bodies, bodies which are not sensible, by the same argument the planes which exist by themselves must be prior to those which are in the motionless solids. Therefore these will be planes and lines other than those that exist along with the mathematical solids to which these thinkers assign separate existence; for the latter exist along

with the mathematical solids, while the others are prior to the mathematical solids.) Again, therefore, there will be, belonging to these planes, lines, and prior to them there will have to be, by the same argument, other lines and points; and prior to these points in the prior lines there will have to be other points, though there will be no others prior to these. Now (1) the accumulation becomes absurd; for we find ourselves with one set of solids apart from the sensible solids; three sets of planes apart from the sensible planes – those which exist apart from the sensible planes, and those in the mathematical solids, and those which exist apart from those in the mathematical solids; four sets of lines, and five sets of points. With which of these, then, will the mathematical sciences deal? Certainly not with the planes and lines and points in the motionless solid; for science always deals with what is prior. And (the same account will apply also to numbers; for there will be a different set of units apart from each set of points, and also apart from each set of realities, from the objects of sense and again from those of thought; so that there will be various classes of mathematical numbers.

Again, how is it possible to solve the questions which we have already enumerated in our discussion of difficulties? For the objects of astronomy will exist apart from sensible things just as the objects of geometry will; but how is it possible that a heaven and its parts – or anything else which has movement – should exist apart? Similarly also the objects of optics and of harmonics will exist apart; for there will be both voice and sight besides the sensible or individual voices and sights. Therefore it is plain that the other senses as well, and the other objects of sense, will exist apart; for why should one set of them do so and another not? And if this is so, there will also be animals existing apart, since there will be senses.

Again, there are certain mathematical theorems that are universal, extending beyond these substances. Here then we shall have another intermediate substance separate both from the Ideas and from the intermediates, – a substance which is neither number nor points nor spatial magnitude nor time. And if this is impossible, plainly it is also impossible that the former entities should exist separate from sensible things.

And, in general, conclusion contrary alike to the truth and to the usual views follow, if one is to suppose the objects of mathematics to exist thus as separate entities. For because they exist thus they must be prior to sensible spatial magnitudes, but in truth they must be posterior; for the incomplete spatial magnitude is in the order of generation prior, but in the order of substance posterior, as the lifeless is to the living.

Again, by virtue of what, and when, will mathematical magnitudes be one? For things in our perceptible world are one in virtue of soul, or of a part of soul, or of something else that is reasonable enough; when these are not present, the thing is a plurality, and splits up into parts. But in the case of the subjects of mathematics, which are divisible and are quantities, what is the cause of their being one and holding together?

Again, the modes of generation of the objects of mathematics show that we are right. For the dimension first generated is length, then comes breadth, lastly depth, and the process is complete. If, then, that which is posterior in the order of generation is prior in the order of substantiality, the solid will be prior to the plane and the line. And in this way also it is both more complete and more whole, because it can become animate. How, on the other hand, could a line or a plane be animate? The supposition passes the power of our senses.

Again, the solid is a sort of substance; for it already has in a sense completeness. But how can lines be substances? Neither

as a form or shape, as the soul perhaps is, nor as matter, like the solid; for we have no experience of anything that can be put together out of lines or planes or points, while if these had been a sort of material substance, we should have observed things which could be put together out of them.

Grant, then, that they are prior in definition. Still not all things that are prior in definition are also prior in substantiality. For those things are prior in substantiality which when separated from other things surpass them in the power of independent existence, but things are prior in definition to those whose definitions are compounded out of their definitions; and these two properties are not coextensive. For if attributes do not exist apart from the substances (e.g. a 'mobile' or a pale'), pale is prior to the pale man in definition, but not in substantiality. For it cannot exist separately, but is always along with the concrete thing; and by the concrete thing I mean the pale man. Therefore it is plain that neither is the result of abstraction prior nor that which is produced by adding determinants posterior; for it is by adding a determinant to pale that we speak of the pale man.

It has, then, been sufficiently pointed out that the objects of mathematics are not substances in a higher degree than bodies are, and that they are not prior to sensibles in being, but only in definition, and that they cannot exist somewhere apart. But since it was not possible for them to exist in sensibles either, it is plain that they either do not exist at all or exist in a special sense and therefore do not 'exist' without qualification. For 'exist' has many senses.

3

For just as the universal propositions of mathematics deal not with objects which exist separately, apart from extended magnitudes and from numbers, but with magnitudes and numbers, not however qua such as to have magnitude or to be divisible, clearly it is possible that there should also be both propositions and demonstrations about sensible magnitudes, not however qua sensible but qua possessed of certain definite qualities. For as there are many propositions about things merely considered as in motion, apart from what each such thing is and from their accidents, and as it is not therefore necessary that there should be either a mobile separate from sensibles, or a distinct mobile entity in the sensibles, so too in the case of mobiles there will be propositions and sciences, which treat them however not qua mobile but only qua bodies, or again only qua planes, or only qua lines, or qua divisibles, or qua indivisibles having position, or only qua indivisibles. Thus since it is true to say without qualification that not only things which are separable but also things which are inseparable exist (for instance, that mobiles exist), it is true also to say without qualification that the objects of mathematics exist, and with the character ascribed to them by mathematicians. And as it is true to say of the other sciences too, without qualification, that they deal with such and such a subject – not with what is accidental to it (e.g. not with the pale, if the healthy thing is pale, and the science has the healthy as its subject), but with that which is the subject of each science – with the healthy if it treats its object qua healthy, with man if qua man: – so too is it with geometry; if its subjects happen to be sensible, though it does not treat them qua sensible, the mathematical sciences will not for that reason be sciences of sensibles – nor, on the other hand, of other things separate from sensibles. Many properties attach to things in virtue of their own nature as possessed of each such character; e.g. there are attributes

peculiar to the animal qua female or qua male (yet there is no 'female' nor 'male' separate from animals); so that there are also attributes which belong to things merely as lengths or as planes. And in proportion as we are dealing with things which are prior in definition and simpler, our knowledge has more accuracy, i.e. simplicity. Therefore a science which abstracts from spatial magnitude is more precise than one which takes it into account; and a science is most precise if it abstracts from movement, but if it takes account of movement, it is most precise if it deals with the primary movement, for this is the simplest; and of this again uniform movement is the simplest form.

The same account may be given of harmonics and optics; for neither considers its objects qua sight or qua voice, but qua lines and numbers; but the latter are attributes proper to the former. And mechanics too proceeds in the same way. Therefore if we suppose attributes separated from their fellow attributes and make any inquiry concerning them as such, we shall not for this reason be in error, any more than when one draws a line on the ground and calls it a foot long when it is not; for the error is not included in the premisses.

Each question will be best investigated in this way – by setting up by an act of separation what is not separate, as the arithmetician and the geometer do. For a man qua man is one indivisible thing; and the arithmetician supposed one indivisible thing, and then considered whether any attribute belongs to a man qua indivisible. But the geometer treats him neither qua man nor qua indivisible, but as a solid. For evidently the properties which would have belonged to him even if perchance he had not been indivisible, can belong to him even apart from these attributes. Thus, then, geometers speak correctly; they talk about existing things, and their subjects do

exist; for being has two forms – it exists not only in complete reality but also materially.

Now since the good and the beautiful are different (for the former always implies conduct as its subject, while the beautiful is found also in motionless things), those who assert that the mathematical sciences say nothing of the beautiful or the good are in error. For these sciences say and prove a great deal about them; if they do not expressly mention them, but prove attributes which are their results or their definitions, it is not true to say that they tell us nothing about them. The chief forms of beauty are order and symmetry and definiteness, which the mathematical sciences demonstrate in a special degree. And since these (e.g. order and definiteness) are obviously causes of many things, evidently these sciences must treat this sort of causative principle also (i.e. the beautiful) as in some sense a cause. But we shall speak more plainly elsewhere about these matters.

4

So much then for the objects of mathematics; we have said that they exist and in what sense they exist, and in what sense they are prior and in what sense not prior. Now, regarding the Ideas, we must first examine the ideal theory itself, not connecting it in any way with the nature of numbers, but treating it in the form in which it was originally understood by those who first maintained the existence of the Ideas. The supporters of the ideal theory were led to it because on the question about the truth of things they accepted the Heraclitean sayings which describe all sensible things as ever passing away, so that if knowledge or thought is to have an object, there must be some

other and permanent entities, apart from those which are sensible; for there could be no knowledge of things which were in a state of flux. But when Socrates was occupying himself with the excellences of character, and in connexion with them became the first to raise the problem of universal definition (for of the physicists Democritus only touched on the subject to a small extent, and defined, after a fashion, the hot and the cold; while the Pythagoreans had before this treated of a few things, whose definitions – e.g. those of opportunity, justice, or marriage – they connected with numbers; but it was natural that Socrates should be seeking the essence, for he was seeking to syllogize, and 'what a thing is' is the starting-point of syllogisms; for there was as yet none of the dialectical power which enables people even without knowledge of the essence to speculate about contraries and inquire whether the same science deals with contraries; for two things may be fairly ascribed to Socrates – inductive arguments and universal definition, both of which are concerned with the starting-point of science): – but Socrates did not make the universals or the definitions exist apart: they, however, gave them separate existence, and this was the kind of thing they called Ideas. Therefore it followed for them, almost by the same argument, that there must be Ideas of all things that are spoken of universally, and it was almost as if a man wished to count certain things, and while they were few thought he would not be able to count them, but made more of them and then counted them; for the Forms are, one may say, more numerous than the particular sensible things, yet it was in seeking the causes of these that they proceeded from them to the Forms. For to each thing there answers an entity which has the same name and exists apart from the substances, and so also in the case of all other groups there is a one over many, whether these be of this world or eternal.

Again, of the ways in which it is proved that the Forms exist, none is convincing; for from some no inference necessarily follows, and from some arise Forms even of things of which they think there are no Forms. For according to the arguments from the sciences there will be Forms of all things of which there are sciences, and according to the argument of the 'one over many' there will be Forms even of negations, and according to the argument that thought has an object when the individual object has perished, there will be Forms of perishable things; for we have an image of these. Again, of the most accurate arguments, some lead to Ideas of relations, of which they say there is no independent class, and others introduce the 'third man'.

And in general the arguments for the Forms destroy things for whose existence the believers in Forms are more zealous than for the existence of the Ideas; for it follows that not the dyad but number is first, and that prior to number is the relative, and that this is prior to the absolute – besides all the other points on which certain people, by following out the opinions held about the Forms, came into conflict with the principles of the theory.

Again, according to the assumption on the belief in the Ideas rests, there will be Forms not only of substances but also of many other things; for the concept is single not only in the case of substances, but also in that of non-substances, and there are sciences of other things than substance; and a thousand other such difficulties confront them. But according to the necessities of the case and the opinions about the Forms, if they can be shared in there must be Ideas of substances only. For they are not shared in incidentally, but each Form must be shared in as something not predicated of a subject. (By 'being shared in incidentally' I mean that if a thing shares in 'double itself', it shares also in 'eternal', but incidentally; for 'the double' happens to be eternal.) Therefore the Forms will be substance.

But the same names indicate substance in this and in the ideal world (or what will be the meaning of saying that there is something apart from the particulars – the one over many?). And if the Ideas and the things that share in them have the same form, there will be something common: for why should ‘2’ be one and the same in the perishable 2’s, or in the 2’s which are many but eternal, and not the same in the ‘2 itself’ as in the individual 2? But if they have not the same form, they will have only the name in common, and it is as if one were to call both Callias and a piece of wood a ‘man’, without observing any community between them.

But if we are to suppose that in other respects the common definitions apply to the Forms, e.g. that ‘plane figure’ and the other parts of the definition apply to the circle itself, but ‘what really is’ has to be added, we must inquire whether this is not absolutely meaningless. For to what is this to be added? To ‘centre’ or to ‘plane’ or to all the parts of the definition? For all the elements in the essence are Ideas, e.g. ‘animal’ and ‘two-footed’. Further, there must be some Ideal answering to ‘plane’ above, some nature which will be present in all the Forms as their genus.

5

Above all one might discuss the question what in the world the Forms contribute to sensible things, either to those that are eternal or to those that come into being and cease to be; for they cause neither movement nor any change in them. But again they help in no wise either towards the knowledge of other things (for they are not even the substance of these, else they would have been in them), or towards their being, if they

are not in the individuals which share in them; though if they were, they might be thought to be causes, as white causes whiteness in a white object by entering into its composition. But this argument, which was used first by Anaxagoras, and later by Eudoxus in his discussion of difficulties and by certain others, is very easily upset; for it is easy to collect many and insuperable objections to such a view.

But, further, all other things cannot come from the Forms in any of the usual senses of 'from'. And to say that they are patterns and the other things share in them is to use empty words and poetical metaphors. For what is it that works, looking to the Ideas? And any thing can both be and come into being without being copied from something else, so that, whether Socrates exists or not, a man like Socrates might come to be. And evidently this might be so even if Socrates were eternal. And there will be several patterns of the same thing, and therefore several Forms; e.g. 'animal' and 'two-footed', and also 'man-himself', will be Forms of man. Again, the Forms are patterns not only of sensible things, but of Forms themselves also; i.e. the genus is the pattern of the various forms-of-a-genus; therefore the same thing will be pattern and copy.

Again, it would seem impossible that substance and that whose substance it is should exist apart; how, therefore, could the Ideas, being the substances of things, exist apart?

In the Phaedo the case is stated in this way – that the Forms are causes both of being and of becoming. Yet though the Forms exist, still things do not come into being, unless there is something to originate movement; and many other things come into being (e.g. a house or a ring) of which they say there are no Forms. Clearly therefore even the things of which they say there are Ideas can both be and come into being owing to such causes as produce the things just mentioned, and not owing to the

Forms. But regarding the Ideas it is possible, both in this way and by more abstract and accurate arguments, to collect many objections like those we have considered.

6

Since we have discussed these points, it is well to consider again the results regarding numbers which confront those who say that numbers are separable substances and first causes of things. If number is an entity and its substance is nothing other than just number, as some say, it follows that either (1) there is a first in it and a second, each being different in species, – and either (a) this is true of the units without exception, and any unit is inassociable with any unit, or (b) they are all without exception successive, and any of them are associable with any, as they say is the case with mathematical number; for in mathematical number no one unit is in any way different from another. Or (c) some units must be associable and some not; e.g. suppose that 2 is first after 1, and then comes 3 and then the rest of the number series, and the units in each number are associable, e.g. those in the first 2 are associable with one another, and those in the first 3 with one another, and so with the other numbers; but the units in the '2-itself' are inassociable with those in the '3-itself'; and similarly in the case of the other successive numbers. And so while mathematical number is counted thus – after 1, 2 (which consists of another 1 besides the former 1), and 3 which consists of another 1 besides these two), and the other numbers similarly, ideal number is counted thus – after 1, a distinct 2 which does not include the first 1, and a 3 which does not include the 2 and the rest of the number series similarly. Or (2) one kind of number must be like the first

that was named, one like that which the mathematicians speak of, and that which we have named last must be a third kind.

Again, these kinds of numbers must either be separable from things, or not separable but in objects of perception (not however in the way which we first considered, in the sense that objects of perception consists of numbers which are present in them) – either one kind and not another, or all of them.

These are of necessity the only ways in which the numbers can exist. And of those who say that the 1 is the beginning and substance and element of all things, and that number is formed from the 1 and something else, almost every one has described number in one of these ways; only no one has said all the units are inassociable. And this has happened reasonably enough; for there can be no way besides those mentioned. Some say both kinds of number exist, that which has a before and after being identical with the Ideas, and mathematical number being different from the Ideas and from sensible things, and both being separable from sensible things; and others say mathematical number alone exists, as the first of realities, separate from sensible things. And the Pythagoreans, also, believe in one kind of number – the mathematical; only they say it is not separate but sensible substances are formed out of it. For they construct the whole universe out of numbers – only not numbers consisting of abstract units; they suppose the units to have spatial magnitude. But how the first 1 was constructed so as to have magnitude, they seem unable to say.

Another thinker says the first kind of number, that of the Forms, alone exists, and some say mathematical number is identical with this.

The case of lines, planes, and solids is similar. For some think that those which are the objects of mathematics are different from those which come after the Ideas; and of those who

express themselves otherwise some speak of the objects of mathematics and in a mathematical way – viz. those who do not make the Ideas numbers nor say that Ideas exist; and others speak of the objects of mathematics, but not mathematically; for they say that neither is every spatial magnitude divisible into magnitudes, nor do any two units taken at random make 2. All who say the 1 is an element and principle of things suppose numbers to consist of abstract units, except the Pythagoreans; but they suppose the numbers to have magnitude, as has been said before. It is clear from this statement, then, in how many ways numbers may be described, and that all the ways have been mentioned; and all these views are impossible, but some perhaps more than others.

7

First, then, let us inquire if the units are associable or inassociable, and if inassociable, in which of the two ways we distinguished. For it is possible that any unity is inassociable with any, and it is possible that those in the 'itself' are inassociable with those in the 'itself', and, generally, that those in each ideal number are inassociable with those in other ideal numbers. Now (1) all units are associable and without difference, we get mathematical number – only one kind of number, and the Ideas cannot be the numbers. For what sort of number will man-himself or animal-itself or any other Form be? There is one Idea of each thing e.g. one of man-himself and another one of animal-itself; but the similar and undifferentiated numbers are infinitely many, so that any particular 3 is no more man-himself than any other 3. But if the Ideas are not numbers, neither can they exist at all. For from what principles will the Ideas come? It is number that comes

from the 1 and the indefinite dyad, and the principles or elements are said to be principles and elements of number, and the Ideas cannot be ranked as either prior or posterior to the numbers.

But (2) if the units are inassociable, and inassociable in the sense that any is inassociable with any other, number of this sort cannot be mathematical number; for mathematical number consists of undifferentiated units, and the truths proved of it suit this character. Nor can it be ideal number. For 2 will not proceed immediately from 1 and the indefinite dyad, and be followed by the successive numbers, as they say '2,3,4' for the units in the ideal are generated at the same time, whether, as the first holder of the theory said, from unequals (coming into being when these were equalized) or in some other way – since, if one unit is to be prior to the other, it will be prior also to 2 the composed of these; for when there is one thing prior and another posterior, the resultant of these will be prior to one and posterior to the other. Again, since the 1-itself is first, and then there is a particular 1 which is first among the others and next after the 1-itself, and again a third which is next after the second and next but one after the first 1, – so the units must be prior to the numbers after which they are named when we count them; e.g. there will be a third unit in 2 before 3 exists, and a fourth and a fifth in 3 before the numbers 4 and 5 exist. – Now none of these thinkers has said the units are inassociable in this way, but according to their principles it is reasonable that they should be so even in this way, though in truth it is impossible. For it is reasonable both that the units should have priority and posteriority if there is a first unit or first 1, and also that the 2's should if there is a first 2; for after the first it is reasonable and necessary that there should be a second, and if a second, a third, and so with the others successively. (And to say both things at the same time, that a unit is first and another unit is second after the ideal 1, and that

a 2 is first after it, is impossible.) But they make a first unit or 1, but not also a second and a third, and a first 2, but not also a second and a third. Clearly, also, it is not possible, if all the units are inassociable, that there should be a 2-itself and a 3-itself; and so with the other numbers. For whether the units are undifferentiated or different each from each, number must be counted by addition, e.g. 2 by adding another 1 to the one, 3 by adding another 1 to the two, and similarly. This being so, numbers cannot be generated as they generate them, from the 2 and the 1; for 2 becomes part of 3 and 3 of 4 and the same happens in the case of the succeeding numbers, but they say 4 came from the first 2 and the indefinite which makes it two 2's other than the 2-itself; if not, the 2-itself will be a part of 4 and one other 2 will be added. And similarly 2 will consist of the 1-itself and another 1; but if this is so, the other element cannot be an indefinite 2; for it generates one unit, not, as the indefinite 2 does, a definite 2.

Again, besides the 3-itself and the 2-itself how can there be other 3's and 2's? And how do they consist of prior and posterior units? All this is absurd and fictitious, and there cannot be a first 2 and then a 3-itself. Yet there must, if the 1 and the indefinite dyad are to be the elements. But if the results are impossible, it is also impossible that these are the generating principles.

If the units, then, are differentiated, each from each, these results and others similar to these follow of necessity. But (3) if those in different numbers are differentiated, but those in the same number are alone undifferentiated from one another, even so the difficulties that follow are no less. E.g. in the 10-itself their are ten units, and the 10 is composed both of them and of two 5's. But since the 10-itself is not any chance number nor composed of any chance 5's – or, for that matter, units – the units in this 10 must differ. For if they do not differ, neither will

the 5's of which the 10 consists differ; but since these differ, the units also will differ. But if they differ, will there be no other 5's in the 10 but only these two, or will there be others? If there are not, this is paradoxical; and if there are, what sort of 10 will consist of them? For there is no other in the 10 but the 10 itself. But it is actually necessary on their view that the 4 should not consist of any chance 2's; for the indefinite as they say, received the definite 2 and made two 2's; for its nature was to double what it received.

Again, as to the 2 being an entity apart from its two units, and the 3 an entity apart from its three units, how is this possible? Either by one's sharing in the other, as 'pale man' is different from 'pale' and 'man' (for it shares in these), or when one is a differentia of the other, as 'man' is different from 'animal' and 'two-footed'.

Again, some things are one by contact, some by intermixture, some by position; none of which can belong to the units of which the 2 or the 3 consists; but as two men are not a unity apart from both, so must it be with the units. And their being indivisible will make no difference to them; for points too are indivisible, but yet a pair of them is nothing apart from the two.

But this consequence also we must not forget, that it follows that there are prior and posterior 2 and similarly with the other numbers. For let the 2's in the 4 be simultaneous; yet these are prior to those in the 8 and as the 2 generated them, they generated the 4's in the 8-itself. Therefore if the first 2 is an Idea, these 2's also will be Ideas of some kind. And the same account applies to the units; for the units in the first 2 generate the four in 4, so that all the units come to be Ideas and an Idea will be composed of Ideas. Clearly therefore those things also of which these happen to be the Ideas will be composite, e.g. one

might say that animals are composed of animals, if there are Ideas of them.

In general, to differentiate the units in any way is an absurdity and a fiction; and by a fiction I mean a forced statement made to suit a hypothesis. For neither in quantity nor in quality do we see unit differing from unit, and number must be either equal or unequal – all number but especially that which consists of abstract units – so that if one number is neither greater nor less than another, it is equal to it; but things that are equal and in no wise differentiated we take to be the same when we are speaking of numbers. If not, not even the 2 in the 10-itself will be undifferentiated, though they are equal; for what reason will the man who alleges that they are not differentiated be able to give?

Again, if every unit + another unit makes two, a unit from the 2-itself and one from the 3-itself will make a 2. Now (a) this will consist of differentiated units; and will it be prior to the 3 or posterior? It rather seems that it must be prior; for one of the units is simultaneous with the 3 and the other is simultaneous with the 2. And we, for our part, suppose that in general 1 and 1, whether the things are equal or unequal, is 2, e.g. the good and the bad, or a man and a horse; but those who hold these views say that not even two units are 2.

If the number of the 3-itself is not greater than that of the 2, this is surprising; and if it is greater, clearly there is also a number in it equal to the 2, so that this is not different from the 2-itself. But this is not possible, if there is a first and a second number.

Nor will the Ideas be numbers. For in this particular point they are right who claim that the units must be different, if there are to be Ideas; as has been said before. For the Form is unique; but if the units are not different, the 2's and the 3's also will not be different. This is also the reason why they must say that when

we count thus – '1,2' – we do not proceed by adding to the given number; for if we do, neither will the numbers be generated from the indefinite dyad, nor can a number be an Idea; for then one Idea will be in another, and all Forms will be parts of one Form. And so with a view to their hypothesis their statements are right, but as a whole they are wrong; for their view is very destructive, since they will admit that this question itself affords some difficulty – whether, when we count and say – 1,2,3 – we count by addition or by separate portions. But we do both; and so it is absurd to reason back from this problem to so great a difference of essence.

8

First of all it is well to determine what is the differentia of a number – and of a unit, if it has a differentia. Units must differ either in quantity or in quality; and neither of these seems to be possible. But number qua number differs in quantity. And if the units also did differ in quantity, number would differ from number, though equal in number of units. Again, are the first units greater or smaller, and do the later ones increase or diminish? All these are irrational suppositions. But neither can they differ in quality. For no attribute can attach to them; for even to numbers quality is said to belong after quantity. Again, quality could not come to them either from the 1 or the dyad; for the former has no quality, and the latter gives quantity; for this entity is what makes things to be many. If the facts are really otherwise, they should state this quite at the beginning and determine if possible, regarding the differentia of the unit, why it must exist, and, failing this, what differentia they mean.

Evidently then, if the Ideas are numbers, the units cannot all be associable, nor can they be inassociable in either of the two ways. But neither is the way in which some others speak about numbers correct. These are those who do not think there are Ideas, either without qualification or as identified with certain numbers, but think the objects of mathematics exist and the numbers are the first of existing things, and the 1-itself is the starting-point of them. It is paradoxical that there should be a 1 which is first of 1's, as they say, but not a 2 which is first of 2's, nor a 3 of 3's; for the same reasoning applies to all. If, then, the facts with regard to number are so, and one supposes mathematical number alone to exist, the 1 is not the starting-point (for this sort of 1 must differ from the other units; and if this is so, there must also be a 2 which is first of 2's, and similarly with the other successive numbers). But if the 1 is the starting-point, the truth about the numbers must rather be what Plato used to say, and there must be a first 2 and 3 and numbers must not be associable with one another. But if on the other hand one supposes this, many impossible results, as we have said, follow. But either this or the other must be the case, so that if neither is, number cannot exist separately.

It is evident, also, from this that the third version is the worst, – the view ideal and mathematical number is the same. For two mistakes must then meet in the one opinion. (1) Mathematical number cannot be of this sort, but the holder of this view has to spin it out by making suppositions peculiar to himself. And (2) he must also admit all the consequences that confront those who speak of number in the sense of 'Forms'.

The Pythagorean version in one way affords fewer difficulties than those before named, but in another way has others peculiar to itself. For not thinking of number as capable of existing separately removes many of the impossible consequences; but that bodies should be composed of numbers,

and that this should be mathematical number, is impossible. For it is not true to speak of indivisible spatial magnitudes; and however much there might be magnitudes of this sort, units at least have not magnitude; and how can a magnitude be composed of indivisibles? But arithmetical number, at least, consists of units, while these thinkers identify number with real things; at any rate they apply their propositions to bodies as if they consisted of those numbers.

If, then, it is necessary, if number is a self-subsistent real thing, that it should exist in one of these ways which have been mentioned, and if it cannot exist in any of these, evidently number has no such nature as those who make it separable set up for it.

Again, does each unit come from the great and the small, equalized, or one from the small, another from the great? (a) If the latter, neither does each thing contain all the elements, nor are the units without difference; for in one there is the great and in another the small, which is contrary in its nature to the great. Again, how is it with the units in the 3-itself? One of them is an odd unit. But perhaps it is for this reason that they give 1-itself the middle place in odd numbers. (b) But if each of the two units consists of both the great and the small, equalized, how will the 2 which is a single thing, consist of the great and the small? Or how will it differ from the unit? Again, the unit is prior to the 2; for when it is destroyed the 2 is destroyed. It must, then, be the Idea of an Idea since it is prior to an Idea, and it must have come into being before it. From what, then? Not from the indefinite dyad, for its function was to double.

Again, number must be either infinite or finite; for these thinkers think of number as capable of existing separately, so that it is not possible that neither of those alternatives should be true. Clearly it cannot be infinite; for infinite number is

neither odd nor even, but the generation of numbers is always the generation either of an odd or of an even number; in one way, when 1 operates on an even number, an odd number is produced; in another way, when 2 operates, the numbers got from 1 by doubling are produced; in another way, when the odd numbers operate, the other even numbers are produced. Again, if every Idea is an Idea of something, and the numbers are Ideas, infinite number itself will be an Idea of something, either of some sensible thing or of something else. Yet this is not possible in view of their thesis any more than it is reasonable in itself, at least if they arrange the Ideas as they do.

But if number is finite, how far does it go? With regard to this not only the fact but the reason should be stated. But if number goes only up to 10 as some say, firstly the Forms will soon run short; e.g. if 3 is man-himself, what number will be the horse-itself? The series of the numbers which are the several things-themselves goes up to 10. It must, then, be one of the numbers within these limits; for it is these that are substances and Ideas. Yet they will run short; for the various forms of animal will outnumber them. At the same time it is clear that if in this way the 3 is man-himself, the other 3's are so also (for those in identical numbers are similar), so that there will be an infinite number of men; if each 3 is an Idea, each of the numbers will be man-himself, and if not, they will at least be men. And if the smaller number is part of the greater (being number of such a sort that the units in the same number are associable), then if the 4-itself is an Idea of something, e.g. of 'horse' or of 'white', man will be a part of horse, if man is It is paradoxical also that there should be an Idea of 10 but not of 11, nor of the succeeding numbers. Again, there both are and come to be certain things of which there are no Forms; why, then, are there not Forms of them also? We infer that the Forms are not causes. Again, it is paradoxical – if the number series up to 10 is more of a real thing and a Form than 10 itself. There is no generation of

the former as one thing, and there is of the latter. But they try to work on the assumption that the series of numbers up to 10 is a complete series. At least they generate the derivatives – e.g. the void, proportion, the odd, and the others of this kind – within the decade. For some things, e.g. movement and rest, good and bad, they assign to the originative principles, and the others to the numbers. This is why they identify the odd with 1; for if the odd implied 3 how would 5 be odd? Again, spatial magnitudes and all such things are explained without going beyond a definite number; e.g. the first, the indivisible, line, then the 2 &c.; these entities also extend only up to 10.

Again, if number can exist separately, one might ask which is prior –1, or 3 or 2? Inasmuch as the number is composite, 1 is prior, but inasmuch as the universal and the form is prior, the number is prior; for each of the units is part of the number as its matter, and the number acts as form. And in a sense the right angle is prior to the acute, because it is determinate and in virtue of its definition; but in a sense the acute is prior, because it is a part and the right angle is divided into acute angles. As matter, then, the acute angle and the element and the unit are prior, but in respect of the form and of the substance as expressed in the definition, the right angle, and the whole consisting of the matter and the form, are prior; for the concrete thing is nearer to the form and to what is expressed in the definition, though in generation it is later. How then is 1 the starting-point? Because it is not divisiable, they say; but both the universal, and the particular or the element, are indivisible. But they are starting-points in different ways, one in definition and the other in time. In which way, then, is 1 the starting-point? As has been said, the right angle is thought to be prior to the acute, and the acute to the right, and each is one. Accordingly they make 1 the starting-point in both ways. But this is impossible. For the universal is one as form or substance, while the element is one as a part or as matter. For each of the

two is in a sense one – in truth each of the two units exists potentially (at least if the number is a unity and not like a heap, i.e. if different numbers consist of differentiated units, as they say), but not in complete reality; and the cause of the error they fell into is that they were conducting their inquiry at the same time from the standpoint of mathematics and from that of universal definitions, so that (1) from the former standpoint they treated unity, their first principle, as a point; for the unit is a point without position. They put things together out of the smallest parts, as some others also have done. Therefore the unit becomes the matter of numbers and at the same time prior to 2; and again posterior, 2 being treated as a whole, a unity, and a form. But (2) because they were seeking the universal they treated the unity which can be predicated of a number, as in this sense also a part of the number. But these characteristics cannot belong at the same time to the same thing.

If the 1-itself must be unitary (for it differs in nothing from other 1's except that it is the starting-point), and the 2 is divisible but the unit is not, the unit must be liker the 1-itself than the 2 is. But if the unit is liker it, it must be liker to the unit than to the 2; therefore each of the units in 2 must be prior to the 2. But they deny this; at least they generate the 2 first. Again, if the 2-itself is a unity and the 3-itself is one also, both form a 2. From what, then, is this 2 produced?

9

Since there is not contact in numbers, but succession, viz. between the units between which there is nothing, e.g. between those in 2 or in 3 one might ask whether these succeed the 1-

itself or not, and whether, of the terms that succeed it, 2 or either of the units in 2 is prior.

Similar difficulties occur with regard to the classes of things posterior to number, – the line, the plane, and the solid. For some construct these out of the species of the 'great and small'; e.g. lines from the 'long and short', planes from the 'broad and narrow', masses from the 'deep and shallow'; which are species of the 'great and small'. And the originative principle of such things which answers to the 1 different thinkers describe in different ways, And in these also the impossibilities, the fictions, and the contradictions of all probability are seen to be innumerable. For (i) geometrical classes are severed from one another, unless the principles of these are implied in one another in such a way that the 'broad and narrow' is also 'long and short' (but if this is so, the plane will be line and the solid a plane; again, how will angles and figures and such things be explained?). And (ii) the same happens as in regard to number; for 'long and short', &c., are attributes of magnitude, but magnitude does not consist of these, any more than the line consists of 'straight and curved', or solids of 'smooth and rough'.

(All these views share a difficulty which occurs with regard to species-of-a-genus, when one posits the universals, viz. whether it is animal-itself or something other than animal-itself that is in the particular animal. True, if the universal is not separable from sensible things, this will present no difficulty; but if the 1 and the numbers are separable, as those who express these views say, it is not easy to solve the difficulty, if one may apply the words 'not easy' to the impossible. For when we apprehend the unity in 2, or in general in a number, do we apprehend a thing-itself or something else?).

Some, then, generate spatial magnitudes from matter of this sort, others from the point – and the point is thought by them to be not 1 but something like 1 – and from other matter like plurality, but not identical with it; about which principles none the less the same difficulties occur. For if the matter is one, line and plane – and soli will be the same; for from the same elements will come one and the same thing. But if the matters are more than one, and there is one for the line and a second for the plane and another for the solid, they either are implied in one another or not, so that the same results will follow even so; for either the plane will not contain a line or it will he a line.

Again, how number can consist of the one and plurality, they make no attempt to explain; but however they express themselves, the same objections arise as confront those who construct number out of the one and the indefinite dyad. For the one view generates number from the universally predicated plurality, and not from a particular plurality; and the other generates it from a particular plurality, but the first; for 2 is said to be a 'first plurality'. Therefore there is practically no difference, but the same difficulties will follow, – is it intermixture or position or blending or generation? and so on. Above all one might press the question 'if each unit is one, what does it come from?' Certainly each is not the one-itself. It must, then, come from the one itself and plurality, or a part of plurality. To say that the unit is a plurality is impossible, for it is indivisible; and to generate it from a part of plurality involves many other objections; for (a) each of the parts must be indivisible (or it will be a plurality and the unit will be divisible) and the elements will not be the one and plurality; for the single units do not come from plurality and the one. Again, (,the holder of this view does nothing but presuppose another number; for his plurality of indivisibles is a number. Again, we must inquire, in view of this theory also, whether the number is infinite or finite. For there was at first, as it seems, a plurality

that was itself finite, from which and from the one comes the finite number of units. And there is another plurality that is plurality-itself and infinite plurality; which sort of plurality, then, is the element which co-operates with the one? One might inquire similarly about the point, i.e. the element out of which they make spatial magnitudes. For surely this is not the one and only point; at any rate, then, let them say out of what each of the points is formed. Certainly not of some distance + the point-itself. Nor again can there be indivisible parts of a distance, as the elements out of which the units are said to be made are indivisible parts of plurality; for number consists of indivisibles, but spatial magnitudes do not.

All these objections, then, and others of the sort make it evident that number and spatial magnitudes cannot exist apart from things. Again, the discord about numbers between the various versions is a sign that it is the incorrectness of the alleged facts themselves that brings confusion into the theories. For those who make the objects of mathematics alone exist apart from sensible things, seeing the difficulty about the Forms and their fictitiousness, abandoned ideal number and posited mathematical. But those who wished to make the Forms at the same time also numbers, but did not see, if one assumed these principles, how mathematical number was to exist apart from ideal, made ideal and mathematical number the same in words, since in fact mathematical number has been destroyed; for they state hypotheses peculiar to themselves and not those of mathematics. And he who first supposed that the Forms exist and that the Forms are numbers and that the objects of mathematics exist, naturally separated the two. Therefore it turns out that all of them are right in some respect, but on the whole not right. And they themselves confirm this, for their statements do not agree but conflict. The cause is that their hypotheses and their principles are false. And it is hard to make

a good case out of bad materials, according to Epicharmus: 'as soon as 'tis said, 'tis seen to be wrong.'

But regarding numbers the questions we have raised and the conclusions we have reached are sufficient (for while he who is already convinced might be further convinced by a longer discussion, one not yet convinced would not come any nearer to conviction); regarding the first principles and the first causes and elements, the views expressed by those who discuss only sensible substance have been partly stated in our works on nature, and partly do not belong to the present inquiry; but the views of those who assert that there are other substances besides the sensible must be considered next after those we have been mentioning. Since, then, some say that the Ideas and the numbers are such substances, and that the elements of these are elements and principles of real things, we must inquire regarding these what they say and in what sense they say it.

Those who posit numbers only, and these mathematical, must be considered later; but as regards those who believe in the Ideas one might survey at the same time their way of thinking and the difficulty into which they fall. For they at the same time make the Ideas universal and again treat them as separable and as individuals. That this is not possible has been argued before. The reason why those who described their substances as universal combined these two characteristics in one thing, is that they did not make substances identical with sensible things. They thought that the particulars in the sensible world were a state of flux and none of them remained, but that the universal was apart from these and something different. And Socrates gave the impulse to this theory, as we said in our earlier discussion, by reason of his definitions, but he did not separate universals from individuals; and in this he thought rightly, in not separating them. This is plain from the results; for

without the universal it is not possible to get knowledge, but the separation is the cause of the objections that arise with regard to the Ideas. His successors, however, treating it as necessary, if there are to be any substances besides the sensible and transient substances, that they must be separable, had no others, but gave separate existence to these universally predicated substances, so that it followed that universals and individuals were almost the same sort of thing. This in itself, then, would be one difficulty in the view we have mentioned.

10

Let us now mention a point which presents a certain difficulty both to those who believe in the Ideas and to those who do not, and which was stated before, at the beginning, among the problems. If we do not suppose substances to be separate, and in the way in which individual things are said to be separate, we shall destroy substance in the sense in which we understand 'substance'; but if we conceive substances to be separable, how are we to conceive their elements and their principles?

If they are individual and not universal, (a) real things will be just of the same number as the elements, and (b) the elements will not be knowable. For (a) let the syllables in speech be substances, and their elements elements of substances; then there must be only one 'ba' and one of each of the syllables, since they are not universal and the same in form but each is one in number and a 'this' and not a kind possessed of a common name (and again they suppose that the 'just what a thing is' is in each case one). And if the syllables are unique, so too are the parts of which they consist; there will not, then, be more a's than one, nor more than one of any of the other

elements, on the same principle on which an identical syllable cannot exist in the plural number. But if this is so, there will not be other things existing besides the elements, but only the elements.

(b) Again, the elements will not be even knowable; for they are not universal, and knowledge is of universals. This is clear from demonstrations and from definitions; for we do not conclude that this triangle has its angles equal to two right angles, unless every triangle has its angles equal to two right angles, nor that this man is an animal, unless every man is an animal.

But if the principles are universal, either the substances composed of them are also universal, or non-substance will be prior to substance; for the universal is not a substance, but the element or principle is universal, and the element or principle is prior to the things of which it is the principle or element.

All these difficulties follow naturally, when they make the Ideas out of elements and at the same time claim that apart from the substances which have the same form there are Ideas, a single separate entity. But if, e.g. in the case of the elements of speech, the a's and the b's may quite well be many and there need be no a-itself and b-itself besides the many, there may be, so far as this goes, an infinite number of similar syllables. The statement that an knowledge is universal, so that the principles of things must also be universal and not separate substances, presents indeed, of all the points we have mentioned, the greatest difficulty, but yet the statement is in a sense true, although in a sense it is not. For knowledge, like the verb 'to know', means two things, of which one is potential and one actual. The potency, being, as matter, universal and indefinite, deals with the universal and indefinite; but the actuality, being definite, deals with a definite object, being a 'this', it deals with a 'this'. But per accidens sight sees universal colour, because this

individual colour which it sees is colour; and this individual a which the grammarian investigates is an a. For if the principles must be universal, what is derived from them must also be universal, as in demonstrations; and if this is so, there will be nothing capable of separate existence – i.e. no substance. But evidently in a sense knowledge is universal, and in a sense it is not.

Book N

1

Regarding this kind of substance, what we have said must be taken as sufficient. All philosophers make the first principles contraries: as in natural things, so also in the case of unchangeable substances. But since there cannot be anything prior to the first principle of all things, the principle cannot be the principle and yet be an attribute of something else. To suggest this is like saying that the white is a first principle, not qua anything else but qua white, but yet that it is predicable of a subject, i.e. that its being white presupposes its being something else; this is absurd, for then that subject will be prior. But all things which are generated from their contraries involve an underlying subject; a subject, then, must be present in the case of contraries, if anywhere. All contraries, then, are always predicable of a subject, and none can exist apart, but just as appearances suggest that there is nothing contrary to

substance, argument confirms this. No contrary, then, is the first principle of all things in the full sense; the first principle is something different.

But these thinkers make one of the contraries matter, some making the unequal which they take to be the essence of plurality-matter for the One, and others making plurality matter for the One. (The former generate numbers out of the dyad of the unequal, i.e. of the great and small, and the other thinker we have referred to generates them out of plurality, while according to both it is generated by the essence of the One.) For even the philosopher who says the unequal and the One are the elements, and the unequal is a dyad composed of the great and small, treats the unequal, or the great and the small, as being one, and does not draw the distinction that they are one in definition, but not in number. But they do not describe rightly even the principles which they call elements, for some name the great and the small with the One and treat these three as elements of numbers, two being matter, one the form; while others name the many and few, because the great and the small are more appropriate in their nature to magnitude than to number; and others name rather the universal character common to these – 'that which exceeds and that which is exceeded'. None of these varieties of opinion makes any difference to speak of, in view of some of the consequences; they affect only the abstract objections, which these thinkers take care to avoid because the demonstrations they themselves offer are abstract, – with this exception, that if the exceeding and the exceeded are the principles, and not the great and the small, consistency requires that number should come from the elements before does; for number is more universal than as the exceeding and the exceeded are more universal than the great and the small. But as it is, they say one of these things but do not say the other. Others oppose the different and the other to the One, and others oppose plurality to the One. But if, as they

claim, things consist of contraries, and to the One either there is nothing contrary, or if there is to be anything it is plurality, and the unequal is contrary to the equal, and the different to the same, and the other to the thing itself, those who oppose the One to plurality have most claim to plausibility, but even their view is inadequate, for the One would on their view be a few; for plurality is opposed to fewness, and the many to the few.

'The one' evidently means a measure. And in every case there is some underlying thing with a distinct nature of its own, e.g. in the scale a quarter-tone, in spatial magnitude a finger or a foot or something of the sort, in rhythms a beat or a syllable; and similarly in gravity it is a definite weight; and in the same way in all cases, in qualities a quality, in quantities a quantity (and the measure is indivisible, in the former case in kind, and in the latter to the sense); which implies that the one is not in itself the substance of anything. And this is reasonable; for 'the one' means the measure of some plurality, and 'number' means a measured plurality and a plurality of measures. (Thus it is natural that one is not a number; for the measure is not measures, but both the measure and the one are starting-points.) The measure must always be some identical thing predicable of all the things it measures, e.g. if the things are horses, the measure is 'horse', and if they are men, 'man'. If they are a man, a horse, and a god, the measure is perhaps 'living being', and the number of them will be a number of living beings. If the things are 'man' and 'pale' and 'walking', these will scarcely have a number, because all belong to a subject which is one and the same in number, yet the number of these will be a number of 'kinds' or of some such term.

Those who treat the unequal as one thing, and the dyad as an indefinite compound of great and small, say what is very far from being probable or possible. For (a) these are modifications and accidents, rather than substrata, of numbers and

magnitudes – the many and few of number, and the great and small of magnitude – like even and odd, smooth and rough, straight and curved. Again, (b) apart from this mistake, the great and the small, and so on, must be relative to something; but what is relative is least of all things a kind of entity or substance, and is posterior to quality and quantity; and the relative is an accident of quantity, as was said, not its matter, since something with a distinct nature of its own must serve as matter both to the relative in general and to its parts and kinds. For there is nothing either great or small, many or few, or, in general, relative to something else, which without having a nature of its own is many or few, great or small, or relative to something else. A sign that the relative is least of all a substance and a real thing is the fact that it alone has no proper generation or destruction or movement, as in respect of quantity there is increase and diminution, in respect of quality alteration, in respect of place locomotion, in respect of substance simple generation and destruction. In respect of relation there is no proper change; for, without changing, a thing will be now greater and now less or equal, if that with which it is compared has changed in quantity. And (c) the matter of each thing, and therefore of substance, must be that which is potentially of the nature in question; but the relative is neither potentially nor actually substance. It is strange, then, or rather impossible, to make not-substance an element in, and prior to, substance; for all the categories are posterior to substance. Again, (d) elements are not predicated of the things of which they are elements, but many and few are predicated both apart and together of number, and long and short of the line, and both broad and narrow apply to the plane. If there is a plurality, then, of which the one term, viz. few, is always predicated, e.g. 2 (which cannot be many, for if it were many, 1 would be few), there must be also one which is absolutely many, e.g. 10 is many (if there is no number which is greater than 10),

or 10,000. How then, in view of this, can number consist of few and many? Either both ought to be predicated of it, or neither; but in fact only the one or the other is predicated.

2

We must inquire generally, whether eternal things can consist of elements. If they do, they will have matter; for everything that consists of elements is composite. Since, then, even if a thing exists for ever, out of that of which it consists it would necessarily also, if it had come into being, have come into being, and since everything comes to be what it comes to be out of that which is it potentially (for it could not have come to be out of that which had not this capacity, nor could it consist of such elements), and since the potential can be either actual or not, – this being so, however everlasting number or anything else that has matter is, it must be capable of not existing, just as that which is any number of years old is as capable of not existing as that which is a day old; if this is capable of not existing, so is that which has lasted for a time so long that it has no limit. They cannot, then, be eternal, since that which is capable of not existing is not eternal, as we had occasion to show in another context. If that which we are now saying is true universally – that no substance is eternal unless it is actuality – and if the elements are matter that underlies substance, no eternal substance can have elements present in it, of which it consists.

There are some who describe the element which acts with the One as an indefinite dyad, and object to 'the unequal', reasonably enough, because of the ensuing difficulties; but they have got rid only of those objections which inevitably arise from the treatment of the unequal, i.e. the relative, as an element;

those which arise apart from this opinion must confront even these thinkers, whether it is ideal number, or mathematical, that they construct out of those elements.

There are many causes which led them off into these explanations, and especially the fact that they framed the difficulty in an obsolete form. For they thought that all things that are would be one (viz. Being itself), if one did not join issue with and refute the saying of Parmenides:

‘For never will this he proved, that things that are not are.’

They thought it necessary to prove that that which is not is; for only thus – of that which is and something else – could the things that are be composed, if they are many.

But, first, if ‘being’ has many senses (for it means sometimes substance, sometimes that it is of a certain quality, sometimes that it is of a certain quantity, and at other times the other categories), what sort of ‘one’, then, are all the things that are, if non-being is to be supposed not to be? Is it the substances that are one, or the affections and similarly the other categories as well, or all together – so that the ‘this’ and the ‘such’ and the ‘so much’ and the other categories that indicate each some one class of being will all be one? But it is strange, or rather impossible, that the coming into play of a single thing should bring it about that part of that which is is a ‘this’, part a ‘such’, part a ‘so much’, part a ‘here’.

Secondly, of what sort of non-being and being do the things that are consist? For ‘nonbeing’ also has many senses, since ‘being’ has; and ‘not being a man’ means not being a certain substance, ‘not being straight’ not being of a certain quality, ‘not being three cubits long’ not being of a certain quantity. What sort of being and non-being, then, by their union pluralize the things that are? This thinker means by the non-being the union of

which with being pluralizes the things that are, the false and the character of falsity. This is also why it used to be said that we must assume something that is false, as geometers assume the line which is not a foot long to be a foot long. But this cannot be so. For neither do geometers assume anything false (for the enunciation is extraneous to the inference), nor is it non-being in this sense that the things that are are generated from or resolved into. But since 'non-being' taken in its various cases has as many senses as there are categories, and besides this the false is said not to be, and so is the potential, it is from this that generation proceeds, man from that which is not man but potentially man, and white from that which is not white but potentially white, and this whether it is some one thing that is generated or many.

The question evidently is, how being, in the sense of 'the substances', is many; for the things that are generated are numbers and lines and bodies. Now it is strange to inquire how being in the sense of the 'what' is many, and not how either qualities or quantities are many. For surely the indefinite dyad or 'the great and the small' is not a reason why there should be two kinds of white or many colours or flavours or shapes; for then these also would be numbers and units. But if they had attacked these other categories, they would have seen the cause of the plurality in substances also; for the same thing or something analogous is the cause. This aberration is the reason also why in seeking the opposite of being and the one, from which with being and the one the things that are proceed, they posited the relative term (i.e. the unequal), which is neither the contrary nor the contradictory of these, and is one kind of being as 'what' and quality also are.

They should have asked this question also, how relative terms are many and not one. But as it is, they inquire how there are many units besides the first 1, but do not go on to inquire how

there are many unequals besides the unequal. Yet they use them and speak of great and small, many and few (from which proceed numbers), long and short (from which proceeds the line), broad and narrow (from which proceeds the plane), deep and shallow (from which proceed solids); and they speak of yet more kinds of relative term. What is the reason, then, why there is a plurality of these?

It is necessary, then, as we say, to presuppose for each thing that which is it potentially; and the holder of these views further declared what that is which is potentially a 'this' and a substance but is not in itself being – viz. that it is the relative (as if he had said 'the qualitative'), which is neither potentially the one or being, nor the negation of the one nor of being, but one among beings. And it was much more necessary, as we said, if he was inquiring how beings are many, not to inquire about those in the same category – how there are many substances or many qualities – but how beings as a whole are many; for some are substances, some modifications, some relations. In the categories other than substance there is yet another problem involved in the existence of plurality. Since they are not separable from substances, qualities and quantities are many just because their substratum becomes and is many; yet there ought to be a matter for each category; only it cannot be separable from substances. But in the case of 'thises', it is possible to explain how the 'this' is many things, unless a thing is to be treated as both a 'this' and a general character. The difficulty arising from the facts about substances is rather this, how there are actually many substances and not one.

But further, if the 'this' and the quantitative are not the same, we are not told how and why the things that are are many, but how quantities are many. For all 'number' means a quantity, and so does the 'unit', unless it means a measure or the quantitatively indivisible. If, then, the quantitative and the

'what' are different, we are not told whence or how the 'what' is many; but if any one says they are the same, he has to face many inconsistencies.

One might fix one's attention also on the question, regarding the numbers, what justifies the belief that they exist. To the believer in Ideas they provide some sort of cause for existing things, since each number is an Idea, and the Idea is to other things somehow or other the cause of their being; for let this supposition be granted them. But as for him who does not hold this view because he sees the inherent objections to the Ideas (so that it is not for this reason that he posits numbers), but who posits mathematical number, why must we believe his statement that such number exists, and of what use is such number to other things? Neither does he who says it exists maintain that it is the cause of anything (he rather says it is a thing existing by itself), nor is it observed to be the cause of anything; for the theorems of arithmeticians will all be found true even of sensible things, as was said before.

3

As for those, then, who suppose the Ideas to exist and to be numbers, by their assumption in virtue of the method of setting out each term apart from its instances – of the unity of each general term they try at least to explain somehow why number must exist. Since their reasons, however, are neither conclusive nor in themselves possible, one must not, for these reasons at least, assert the existence of number. Again, the Pythagoreans, because they saw many attributes of numbers belonging te sensible bodies, supposed real things to be numbers – not separable numbers, however, but numbers of which real things

consist. But why? Because the attributes of numbers are present in a musical scale and in the heavens and in many other things. Those, however, who say that mathematical number alone exists cannot according to their hypotheses say anything of this sort, but it used to be urged that these sensible things could not be the subject of the sciences. But we maintain that they are, as we said before. And it is evident that the objects of mathematics do not exist apart; for if they existed apart their attributes would not have been present in bodies. Now the Pythagoreans in this point are open to no objection; but in that they construct natural bodies out of numbers, things that have lightness and weight out of things that have not weight or lightness, they seem to speak of another heaven and other bodies, not of the sensible. But those who make number separable assume that it both exists and is separable because the axioms would not be true of sensible things, while the statements of mathematics are true and 'greet the soul'; and similarly with the spatial magnitudes of mathematics. It is evident, then, both that the rival theory will say the contrary of this, and that the difficulty we raised just now, why if numbers are in no way present in sensible things their attributes are present in sensible things, has to be solved by those who hold these views.

There are some who, because the point is the limit and extreme of the line, the line of the plane, and the plane of the solid, think there must be real things of this sort. We must therefore examine this argument too, and see whether it is not remarkably weak. For (i) extremes are not substances, but rather all these things are limits. For even walking, and movement in general, has a limit, so that on their theory this will be a 'this' and a substance. But that is absurd. Not but what (ii) even if they are substances, they will all be the substances of the sensible things in this world; for it is to these that the argument applied. Why then should they be capable of existing apart?

Again, if we are not too easily satisfied, we may, regarding all number and the objects of mathematics, press this difficulty, that they contribute nothing to one another, the prior to the posterior; for if number did not exist, none the less spatial magnitudes would exist for those who maintain the existence of the objects of mathematics only, and if spatial magnitudes did not exist, soul and sensible bodies would exist. But the observed facts show that nature is not a series of episodes, like a bad tragedy. As for the believers in the Ideas, this difficulty misses them; for they construct spatial magnitudes out of matter and number, lines out of the number planes doubtless out of solids out of or they use other numbers, which makes no difference. But will these magnitudes be Ideas, or what is their manner of existence, and what do they contribute to things? These contribute nothing, as the objects of mathematics contribute nothing. But not even is any theorem true of them, unless we want to change the objects of mathematics and invent doctrines of our own. But it is not hard to assume any random hypotheses and spin out a long string of conclusions. These thinkers, then, are wrong in this way, in wanting to unite the objects of mathematics with the Ideas. And those who first posited two kinds of number, that of the Forms and that which is mathematical, neither have said nor can say how mathematical number is to exist and of what it is to consist. For they place it between ideal and sensible number. If (i) it consists of the great and small, it will be the same as the other-ideal-number (he makes spatial magnitudes out of some other small and great). And if (ii) he names some other element, he will be making his elements rather many. And if the principle of each of the two kinds of number is a 1, unity will be something common to these, and we must inquire how the one is these many things, while at the same time number, according to him, cannot be generated except from one and an indefinite dyad.

All this is absurd, and conflicts both with itself and with the probabilities, and we seem to see in it Simonides 'long rigmarole' for the long rigmarole comes into play, like those of slaves, when men have nothing sound to say. And the very elements – the great and the small – seem to cry out against the violence that is done to them; for they cannot in any way generate numbers other than those got from 1 by doubling.

It is strange also to attribute generation to things that are eternal, or rather this is one of the things that are impossible. There need be no doubt whether the Pythagoreans attribute generation to them or not; for they say plainly that when the one had been constructed, whether out of planes or of surface or of seed or of elements which they cannot express, immediately the nearest part of the unlimited began to be constrained and limited by the limit. But since they are constructing a world and wish to speak the language of natural science, it is fair to make some examination of their physical theorics, but to let them off from the present inquiry; for we are investigating the principles at work in unchangeable things, so that it is numbers of this kind whose genesis we must study.

4

These thinkers say there is no generation of the odd number, which evidently implies that there is generation of the even; and some present the even as produced first from unequals – the great and the small – when these are equalized. The inequality, then, must belong to them before they are equalized. If they had always been equalized, they would not have been unequal before; for there is nothing before that which is always. Therefore evidently they are not giving their account of the

generation of numbers merely to assist contemplation of their nature.

A difficulty, and a reproach to any one who finds it no difficulty, are contained in the question how the elements and the principles are related to the good and the beautiful; the difficulty is this, whether any of the elements is such a thing as we mean by the good itself and the best, or this is not so, but these are later in origin than the elements. The theologians seem to agree with some thinkers of the present day, who answer the question in the negative, and say that both the good and the beautiful appear in the nature of things only when that nature has made some progress. (This they do to avoid a real objection which confronts those who say, as some do, that the one is a first principle. The objection arises not from their ascribing goodness to the first principle as an attribute, but from their making the one a principle – and a principle in the sense of an element – and generating number from the one.) The old poets agree with this inasmuch as they say that not those who are first in time, e.g. Night and Heaven or Chaos or Ocean, reign and rule, but Zeus. These poets, however, are led to speak thus only because they think of the rulers of the world as changing; for those of them who combine the two characters in that they do not use mythical language throughout, e.g. Pherecydes and some others, make the original generating agent the Best, and so do the Magi, and some of the later sages also, e.g. both Empedocles and Anaxagoras, of whom one made love an element, and the other made reason a principle. Of those who maintain the existence of the unchangeable substances some say the One itself is the good itself; but they thought its substance lay mainly in its unity.

This, then, is the problem, – which of the two ways of speaking is right. It would be strange if to that which is primary and eternal and most self-sufficient this very quality – self-

sufficiency and self-maintenance – belongs primarily in some other way than as a good. But indeed it can be for no other reason indestructible or self-sufficient than because its nature is good. Therefore to say that the first principle is good is probably correct; but that this principle should be the One or, if not that, at least an element, and an element of numbers, is impossible. Powerful objections arise, to avoid which some have given up the theory (viz. those who agree that the One is a first principle and element, but only of mathematical number). For on this view all the units become identical with species of good, and there is a great profusion of goods. Again, if the Forms are numbers, all the Forms are identical with species of good. But let a man assume Ideas of anything he pleases. If these are Ideas only of goods, the Ideas will not be substances; but if the Ideas are also Ideas of substances, all animals and plants and all individuals that share in Ideas will be good.

These absurdities follow, and it also follows that the contrary element, whether it is plurality or the unequal, i.e. the great and small, is the bad-itself. (Hence one thinker avoided attaching the good to the One, because it would necessarily follow, since generation is from contraries, that badness is the fundamental nature of plurality; while others say inequality is the nature of the bad.) It follows, then, that all things partake of the bad except one – the One itself, and that numbers partake of it in a more undiluted form than spatial magnitudes, and that the bad is the space in which the good is realized, and that it partakes in and desires that which tends to destroy it; for contrary tends to destroy contrary. And if, as we were saying, the matter is that which is potentially each thing, e.g. that of actual fire is that which is potentially fire, the bad will be just the potentially good.

All these objections, then, follow, partly because they make every principle an element, partly because they make contraries

principles, partly because they make the One a principle, partly because they treat the numbers as the first substances, and as capable of existing apart, and as Forms.

5

If, then, it is equally impossible not to put the good among the first principles and to put it among them in this way, evidently the principles are not being correctly described, nor are the first substances. Nor does any one conceive the matter correctly if he compares the principles of the universe to that of animals and plants, on the ground that the more complete always comes from the indefinite and incomplete – which is what leads this thinker to say that this is also true of the first principles of reality, so that the One itself is not even an existing thing. This is incorrect, for even in this world of animals and plants the principles from which these come are complete; for it is a man that produces a man, and the seed is not first.

It is out of place, also, to generate place simultaneously with the mathematical solids (for place is peculiar to the individual things, and hence they are separate in place; but mathematical objects are nowhere), and to say that they must be somewhere, but not say what kind of thing their place is.

Those who say that existing things come from elements and that the first of existing things are the numbers, should have first distinguished the senses in which one thing comes from another, and then said in which sense number comes from its first principles.

By intermixture? But (1) not everything is capable of intermixture, and (2) that which is produced by it is different

from its elements, and on this view the one will not remain separate or a distinct entity; but they want it to be so.

By juxtaposition, like a syllable? But then (1) the elements must have position; and (2) he who thinks of number will be able to think of the unity and the plurality apart; number then will be this – a unit and plurality, or the one and the unequal.

Again, coming from certain things means in one sense that these are still to be found in the product, and in another that they are not; which sense does number come from these elements? Only things that are generated can come from elements which are present in them. Does number come, then, from its elements as from seed? But nothing can be excreted from that which is indivisible. Does it come from its contrary, its contrary not persisting? But all things that come in this way come also from something else which does persist. Since, then, one thinker places the 1 as contrary to plurality, and another places it as contrary to the unequal, treating the 1 as equal, number must be being treated as coming from contraries. There is, then, something else that persists, from which and from one contrary the compound is or has come to be. Again, why in the world do the other things that come from contraries, or that have contraries, perish (even when all of the contrary is used to produce them), while number does not? Nothing is said about this. Yet whether present or not present in the compound the contrary destroys it, e.g. 'strife' destroys the 'mixture' (yet it should not; for it is not to that that is contrary).

Once more, it has not been determined at all in which way numbers are the causes of substances and of being – whether (1) as boundaries (as points are of spatial magnitudes). This is how Eurytus decided what was the number of what (e.g. one of man and another of horse), viz. by imitating the figures of living things with pebbles, as some people bring numbers into the

forms of triangle and square. Or (2) is it because harmony is a ratio of numbers, and so is man and everything else? But how are the attributes – white and sweet and hot – numbers? Evidently it is not the numbers that are the essence or the causes of the form; for the ratio is the essence, while the number the causes of the form; for the ratio is the essence, while the number is the matter. E.g. the essence of flesh or bone is number only in this way, 'three parts of fire and two of earth'. And a number, whatever number it is, is always a number of certain things, either of parts of fire or earth or of units; but the essence is that there is so much of one thing to so much of another in the mixture; and this is no longer a number but a ratio of mixture of numbers, whether these are corporeal or of any other kind.

Number, then, whether it be number in general or the number which consists of abstract units, is neither the cause as agent, nor the matter, nor the ratio and form of things. Nor, of course, is it the final cause.

6

One might also raise the question what the good is that things get from numbers because their composition is expressible by a number, either by one which is easily calculable or by an odd number. For in fact honey-water is no more wholesome if it is mixed in the proportion of three times three, but it would do more good if it were in no particular ratio but well diluted than if it were numerically expressible but strong. Again, the ratios of mixtures are expressed by the adding of numbers, not by mere numbers; e.g. it is 'three parts to two', not 'three times two'. For in any multiplication the genus of the things multiplied must be

the same; therefore the product 1x2x3 must be measurable by 1, and 4x5x6 by 4 and therefore all products into which the same factor enters must be measurable by that factor. The number of fire, then, cannot be 2x5x3x6 and at the same time that of water 2x3.

If all things must share in number, it must follow that many things are the same, and the same number must belong to one thing and to another. Is number the cause, then, and does the thing exist because of its number, or is this not certain? E.g. the motions of the sun have a number, and again those of the moon, – yes, and the life and prime of each animal. Why, then, should not some of these numbers be squares, some cubes, and some equal, others double? There is no reason why they should not, and indeed they must move within these limits, since all things were assumed to share in number. And it was assumed that things that differed might fall under the same number. Therefore if the same number had belonged to certain things, these would have been the same as one another, since they would have had the same form of number; e.g. sun and moon would have been the same. But why need these numbers be causes? There are seven vowels, the scale consists of seven strings, the Pleiades are seven, at seven animals lose their teeth (at least some do, though some do not), and the champions who fought against Thebes were seven. Is it then because the number is the kind of number it is, that the champions were seven or the Pleiad consists of seven stars? Surely the champions were seven because there were seven gates or for some other reason, and the Pleiad we count as seven, as we count the Bear as twelve, while other peoples count more stars in both. Nay they even say that X, Ps and Z are concords and that because there are three concords, the double consonants also are three. They quite neglect the fact that there might be a thousand such letters; for one symbol might be assigned to GP. But if they say that each of these three is equal to two of the

other letters, and no other is so, and if the cause is that there are three parts of the mouth and one letter is in each applied to sigma, it is for this reason that there are only three, not because the concords are three; since as a matter of fact the concords are more than three, but of double consonants there cannot be more.

These people are like the old-fashioned Homeric scholars, who see small resemblances but neglect great ones. Some say that there are many such cases, e.g. that the middle strings are represented by nine and eight, and that the epic verse has seventeen syllables, which is equal in number to the two strings, and that the scansion is, in the right half of the line nine syllables, and in the left eight. And they say that the distance in the letters from alpha to omega is equal to that from the lowest note of the flute to the highest, and that the number of this note is equal to that of the whole choir of heaven. It may be suspected that no one could find difficulty either in stating such analogies or in finding them in eternal things, since they can be found even in perishable things.

But the lauded characteristics of numbers, and the contraries of these, and generally the mathematical relations, as some describe them, making them causes of nature, seem, when we inspect them in this way, to vanish; for none of them is a cause in any of the senses that have been distinguished in reference to the first principles. In a sense, however, they make it plain that goodness belongs to numbers, and that the odd, the straight, the square, the potencies of certain numbers, are in the column of the beautiful. For the seasons and a particular kind of number go together; and the other agreements that they collect from the theorems of mathematics all have this meaning. Hence they are like coincidences. For they are accidents, but the things that agree are all appropriate to one another, and one by analogy. For in each category of being an analogous term is

found – as the straight is in length, so is the level in surface, perhaps the odd in number, and the white in colour.

Again, it is not the ideal numbers that are the causes of musical phenomena and the like (for equal ideal numbers differ from one another in form; for even the units do); so that we need not assume Ideas for this reason at least.

These, then, are the results of the theory, and yet more might be brought together. The fact that our opponnts have much trouble with the generation of numbers and can in no way make a system of them, seems to indicate that the objects of mathematics are not separable from sensible things, as some say, and that they are not the first principles.

Aristotle - Nicomachean Ethics

[Translated by W. D. Ross]

Book I

1

Every art and every inquiry, and similarly every action and pursuit, is thought to aim at some good; and for this reason the good has rightly been declared to be that at which all things aim. But a certain difference is found among ends; some are activities, others are products apart from the activities that produce them. Where there are ends apart from the actions, it is the nature of the products to be better than the activities. Now, as there are many actions, arts, and sciences, their ends also are many; the end of the medical art is health, that of shipbuilding a vessel, that of strategy victory, that of economics wealth. But where such arts fall under a single capacity – as bridle-making and the other arts concerned with the equipment of horses fall under the art of riding, and this and every military action under strategy, in the same way other arts fall under yet others – in all of these the ends of the master arts are to be preferred to all the subordinate ends; for it is for the sake of the former that the latter are pursued. It makes no difference whether the activities themselves are the ends of the actions, or something else apart from the activities, as in the case of the sciences just mentioned.

2

If, then, there is some end of the things we do, which we desire for its own sake (everything else being desired for the sake of this), and if we do not choose everything for the sake of something else (for at that rate the process would go on to infinity, so that our desire would be empty and vain), clearly this must be the good and the chief good. Will not the knowledge of it, then, have a great influence on life? Shall we not, like archers who have a mark to aim at, be more likely to hit upon what is right? If so, we must try, in outline at least, to determine what it is, and of which of the sciences or capacities it is the object. It would seem to belong to the most authoritative art and that which is most truly the master art. And politics appears to be of this nature; for it is this that ordains which of the sciences should be studied in a state, and which each class of citizens should learn and up to what point they should learn them; and we see even the most highly esteemed of capacities to fall under this, e.g. strategy, economics, rhetoric; now, since politics uses the rest of the sciences, and since, again, it legislates as to what we are to do and what we are to abstain from, the end of this science must include those of the others, so that this end must be the good for man. For even if the end is the same for a single man and for a state, that of the state seems at all events something greater and more complete whether to attain or to preserve; though it is worth while to attain the end merely for one man, it is finer and more godlike to attain it for a nation or for city-states. These, then, are the ends at which our inquiry aims, since it is political science, in one sense of that term.

3

Our discussion will be adequate if it has as much clearness as the subject-matter admits of, for precision is not to be sought for alike in all discussions, any more than in all the products of the crafts. Now fine and just actions, which political science investigates, admit of much variety and fluctuation of opinion, so that they may be thought to exist only by convention, and not by nature. And goods also give rise to a similar fluctuation because they bring harm to many people; for before now men have been undone by reason of their wealth, and others by reason of their courage. We must be content, then, in speaking of such subjects and with such premisses to indicate the truth roughly and in outline, and in speaking about things which are only for the most part true and with premisses of the same kind to reach conclusions that are no better. In the same spirit, therefore, should each type of statement be received; for it is the mark of an educated man to look for precision in each class of things just so far as the nature of the subject admits; it is evidently equally foolish to accept probable reasoning from a mathematician and to demand from a rhetorician scientific proofs.

Now each man judges well the things he knows, and of these he is a good judge. And so the man who has been educated in a subject is a good judge of that subject, and the man who has received an all-round education is a good judge in general. Hence a young man is not a proper hearer of lectures on political science; for he is inexperienced in the actions that occur in life, but its discussions start from these and are about these; and, further, since he tends to follow his passions, his study will be vain and unprofitable, because the end aimed at is not knowledge but action. And it makes no difference whether he is young in years or youthful in character; the defect does not depend on time, but on his living, and pursuing each

successive object, as passion directs. For to such persons, as to the incontinent, knowledge brings no profit; but to those who desire and act in accordance with a rational principle knowledge about such matters will be of great benefit.

These remarks about the student, the sort of treatment to be expected, and the purpose of the inquiry, may be taken as our preface.

4

Let us resume our inquiry and state, in view of the fact that all knowledge and every pursuit aims at some good, what it is that we say political science aims at and what is the highest of all goods achievable by action. Verbally there is very general agreement; for both the general run of men and people of superior refinement say that it is happiness, and identify living well and doing well with being happy; but with regard to what happiness is they differ, and the many do not give the same account as the wise. For the former think it is some plain and obvious thing, like pleasure, wealth, or honour; they differ, however, from one another – and often even the same man identifies it with different things, with health when he is ill, with wealth when he is poor; but, conscious of their ignorance, they admire those who proclaim some great ideal that is above their comprehension. Now some thought that apart from these many goods there is another which is self-subsistent and causes the goodness of all these as well. To examine all the opinions that have been held were perhaps somewhat fruitless; enough to examine those that are most prevalent or that seem to be arguable.

Let us not fail to notice, however, that there is a difference between arguments from and those to the first principles. For Plato, too, was right in raising this question and asking, as he used to do, 'are we on the way from or to the first principles?' There is a difference, as there is in a race-course between the course from the judges to the turning-point and the way back. For, while we must begin with what is known, things are objects of knowledge in two senses – some to us, some without qualification. Presumably, then, we must begin with things known to us. Hence any one who is to listen intelligently to lectures about what is noble and just, and generally, about the subjects of political science must have been brought up in good habits. For the fact is the starting-point, and if this is sufficiently plain to him, he will not at the start need the reason as well; and the man who has been well brought up has or can easily get startingpoints. And as for him who neither has nor can get them, let him hear the words of Hesiod:

Far best is he who knows all things himself;

Good, he that hearkens when men counsel right;

But he who neither knows, nor lays to heart

Another's wisdom, is a useless wight.

5

Let us, however, resume our discussion from the point at which we digressed. To judge from the lives that men lead, most men, and men of the most vulgar type, seem (not without some ground) to identify the good, or happiness, with pleasure; which is the reason why they love the life of enjoyment. For there are,

we may say, three prominent types of life – that just mentioned, the political, and thirdly the contemplative life. Now the mass of mankind are evidently quite slavish in their tastes, preferring a life suitable to beasts, but they get some ground for their view from the fact that many of those in high places share the tastes of Sardanapallus. A consideration of the prominent types of life shows that people of superior refinement and of active disposition identify happiness with honour; for this is, roughly speaking, the end of the political life. But it seems too superficial to be what we are looking for, since it is thought to depend on those who bestow honour rather than on him who receives it, but the good we divine to be something proper to a man and not easily taken from him. Further, men seem to pursue honour in order that they may be assured of their goodness; at least it is by men of practical wisdom that they seek to be honoured, and among those who know them, and on the ground of their virtue; clearly, then, according to them, at any rate, virtue is better. And perhaps one might even suppose this to be, rather than honour, the end of the political life. But even this appears somewhat incomplete; for possession of virtue seems actually compatible with being asleep, or with lifelong inactivity, and, further, with the greatest sufferings and misfortunes; but a man who was living so no one would call happy, unless he were maintaining a thesis at all costs. But enough of this; for the subject has been sufficiently treated even in the current discussions. Third comes the contemplative life, which we shall consider later.

The life of money-making is one undertaken under compulsion, and wealth is evidently not the good we are seeking; for it is merely useful and for the sake of something else. And so one might rather take the aforenamed objects to be ends; for they are loved for themselves. But it is evident that not even these are ends; yet many arguments have been thrown away in support of them. Let us leave this subject, then.

6

We had perhaps better consider the universal good and discuss thoroughly what is meant by it, although such an inquiry is made an uphill one by the fact that the Forms have been introduced by friends of our own. Yet it would perhaps be thought to be better, indeed to be our duty, for the sake of maintaining the truth even to destroy what touches us closely, especially as we are philosophers or lovers of wisdom; for, while both are dear, piety requires us to honour truth above our friends.

The men who introduced this doctrine did not posit Ideas of classes within which they recognized priority and posteriority (which is the reason why they did not maintain the existence of an Idea embracing all numbers); but the term 'good' is used both in the category of substance and in that of quality and in that of relation, and that which is per se, i.e. substance, is prior in nature to the relative (for the latter is like an off shoot and accident of being); so that there could not be a common Idea set over all these goods. Further, since 'good' has as many senses as 'being' (for it is predicated both in the category of substance, as of God and of reason, and in quality, i.e. of the virtues, and in quantity, i.e. of that which is moderate, and in relation, i.e. of the useful, and in time, i.e. of the right opportunity, and in place, i.e. of the right locality and the like), clearly it cannot be something universally present in all cases and single; for then it could not have been predicated in all the categories but in one only. Further, since of the things answering to one Idea there is one science, there would have been one science of all the goods; but as it is there are many sciences even of the things that fall under one category, e.g. of opportunity, for opportunity in war is

studied by strategics and in disease by medicine, and the moderate in food is studied by medicine and in exercise by the science of gymnastics. And one might ask the question, what in the world they mean by 'a thing itself', is (as is the case) in 'man himself' and in a particular man the account of man is one and the same. For in so far as they are man, they will in no respect differ; and if this is so, neither will 'good itself' and particular goods, in so far as they are good. But again it will not be good any the more for being eternal, since that which lasts long is no whiter than that which perishes in a day. The Pythagoreans seem to give a more plausible account of the good, when they place the one in the column of goods; and it is they that Speusippus seems to have followed.

But let us discuss these matters elsewhere; an objection to what we have said, however, may be discerned in the fact that the Platonists have not been speaking about all goods, and that the goods that are pursued and loved for themselves are called good by reference to a single Form, while those which tend to produce or to preserve these somehow or to prevent their contraries are called so by reference to these, and in a secondary sense. Clearly, then, goods must be spoken of in two ways, and some must be good in themselves, the others by reason of these. Let us separate, then, things good in themselves from things useful, and consider whether the former are called good by reference to a single Idea. What sort of goods would one call good in themselves? Is it those that are pursued even when isolated from others, such as intelligence, sight, and certain pleasures and honours? Certainly, if we pursue these also for the sake of something else, yet one would place them among things good in themselves. Or is nothing other than the Idea of good good in itself? In that case the Form will be empty. But if the things we have named are also things good in themselves, the account of the good will have to appear as something identical in them all, as that of whiteness is identical in snow

and in white lead. But of honour, wisdom, and pleasure, just in respect of their goodness, the accounts are distinct and diverse. The good, therefore, is not some common element answering to one Idea.

But what then do we mean by the good? It is surely not like the things that only chance to have the same name. Are goods one, then, by being derived from one good or by all contributing to one good, or are they rather one by analogy? Certainly as sight is in the body, so is reason in the soul, and so on in other cases. But perhaps these subjects had better be dismissed for the present; for perfect precision about them would be more appropriate to another branch of philosophy. And similarly with regard to the Idea; even if there is some one good which is universally predicable of goods or is capable of separate and independent existence, clearly it could not be achieved or attained by man; but we are now seeking something attainable. Perhaps, however, some one might think it worth while to recognize this with a view to the goods that are attainable and achievable; for having this as a sort of pattern we shall know better the goods that are good for us, and if we know them shall attain them. This argument has some plausibility, but seems to clash with the procedure of the sciences; for all of these, though they aim at some good and seek to supply the deficiency of it, leave on one side the knowledge of the good. Yet that all the exponents of the arts should be ignorant of, and should not even seek, so great an aid is not probable. It is hard, too, to see how a weaver or a carpenter will be benefited in regard to his own craft by knowing this 'good itself', or how the man who has viewed the Idea itself will be a better doctor or general thereby. For a doctor seems not even to study health in this way, but the health of man, or perhaps rather the health of a particular man; it is individuals that he is healing. But enough of these topics.

7

Let us again return to the good we are seeking, and ask what it can be. It seems different in different actions and arts; it is different in medicine, in strategy, and in the other arts likewise. What then is the good of each? Surely that for whose sake everything else is done. In medicine this is health, in strategy victory, in architecture a house, in any other sphere something else, and in every action and pursuit the end; for it is for the sake of this that all men do whatever else they do. Therefore, if there is an end for all that we do, this will be the good achievable by action, and if there are more than one, these will be the goods achievable by action.

So the argument has by a different course reached the same point; but we must try to state this even more clearly. Since there are evidently more than one end, and we choose some of these (e.g. wealth, flutes, and in general instruments) for the sake of something else, clearly not all ends are final ends; but the chief good is evidently something final. Therefore, if there is only one final end, this will be what we are seeking, and if there are more than one, the most final of these will be what we are seeking. Now we call that which is in itself worthy of pursuit more final than that which is worthy of pursuit for the sake of something else, and that which is never desirable for the sake of something else more final than the things that are desirable both in themselves and for the sake of that other thing, and therefore we call final without qualification that which is always desirable in itself and never for the sake of something else.

Now such a thing happiness, above all else, is held to be; for this we choose always for self and never for the sake of something else, but honour, pleasure, reason, and every virtue we choose

indeed for themselves (for if nothing resulted from them we should still choose each of them), but we choose them also for the sake of happiness, judging that by means of them we shall be happy. Happiness, on the other hand, no one chooses for the sake of these, nor, in general, for anything other than itself.

From the point of view of self-sufficiency the same result seems to follow; for the final good is thought to be self-sufficient. Now by self-sufficient we do not mean that which is sufficient for a man by himself, for one who lives a solitary life, but also for parents, children, wife, and in general for his friends and fellow citizens, since man is born for citizenship. But some limit must be set to this; for if we extend our requirement to ancestors and descendants and friends' friends we are in for an infinite series. Let us examine this question, however, on another occasion; the self-sufficient we now define as that which when isolated makes life desirable and lacking in nothing; and such we think happiness to be; and further we think it most desirable of all things, without being counted as one good thing among others – if it were so counted it would clearly be made more desirable by the addition of even the least of goods; for that which is added becomes an excess of goods, and of goods the greater is always more desirable. Happiness, then, is something final and self-sufficient, and is the end of action.

Presumably, however, to say that happiness is the chief good seems a platitude, and a clearer account of what it is still desired. This might perhaps be given, if we could first ascertain the function of man. For just as for a flute-player, a sculptor, or an artist, and, in general, for all things that have a function or activity, the good and the 'well' is thought to reside in the function, so would it seem to be for man, if he has a function. Have the carpenter, then, and the tanner certain functions or activities, and has man none? Is he born without a function? Or as eye, hand, foot, and in general each of the parts evidently has

a function, may one lay it down that man similarly has a function apart from all these? What then can this be? Life seems to be common even to plants, but we are seeking what is peculiar to man. Let us exclude, therefore, the life of nutrition and growth. Next there would be a life of perception, but it also seems to be common even to the horse, the ox, and every animal. There remains, then, an active life of the element that has a rational principle; of this, one part has such a principle in the sense of being obedient to one, the other in the sense of possessing one and exercising thought. And, as 'life of the rational element' also has two meanings, we must state that life in the sense of activity is what we mean; for this seems to be the more proper sense of the term. Now if the function of man is an activity of soul which follows or implies a rational principle, and if we say 'so-and-so-and 'a good so-and-so' have a function which is the same in kind, e.g. a lyre, and a good lyre-player, and so without qualification in all cases, eminence in respect of goodness being idded to the name of the function (for the function of a lyre-player is to play the lyre, and that of a good lyre-player is to do so well): if this is the case, and we state the function of man to be a certain kind of life, and this to be an activity or actions of the soul implying a rational principle, and the function of a good man to be the good and noble performance of these, and if any action is well performed when it is performed in accordance with the appropriate excellence: if this is the case, human good turns out to be activity of soul in accordance with virtue, and if there are more than one virtue, in accordance with the best and most complete.

But we must add 'in a complete life.' For one swallow does not make a summer, nor does one day; and so too one day, or a short time, does not make a man blessed and happy.

Let this serve as an outline of the good; for we must presumably first sketch it roughly, and then later fill in the details. But it

would seem that any one is capable of carrying on and articulating what has once been well outlined, and that time is a good discoverer or partner in such a work; to which facts the advances of the arts are due; for any one can add what is lacking. And we must also remember what has been said before, and not look for precision in all things alike, but in each class of things such precision as accords with the subject-matter, and so much as is appropriate to the inquiry. For a carpenter and a geometer investigate the right angle in different ways; the former does so in so far as the right angle is useful for his work, while the latter inquires what it is or what sort of thing it is; for he is a spectator of the truth. We must act in the same way, then, in all other matters as well, that our main task may not be subordinated to minor questions. Nor must we demand the cause in all matters alike; it is enough in some cases that the fact be well established, as in the case of the first principles; the fact is the primary thing or first principle. Now of first principles we see some by induction, some by perception, some by a certain habituation, and others too in other ways. But each set of principles we must try to investigate in the natural way, and we must take pains to state them definitely, since they have a great influence on what follows. For the beginning is thought to be more than half of the whole, and many of the questions we ask are cleared up by it.

8

We must consider it, however, in the light not only of our conclusion and our premisses, but also of what is commonly said about it; for with a true view all the data harmonize, but with a false one the facts soon clash. Now goods have been divided into three classes, and some are described as external,

others as relating to soul or to body; we call those that relate to soul most properly and truly goods, and psychical actions and activities we class as relating to soul. Therefore our account must be sound, at least according to this view, which is an old one and agreed on by philosophers. It is correct also in that we identify the end with certain actions and activities; for thus it falls among goods of the soul and not among external goods. Another belief which harmonizes with our account is that the happy man lives well and does well; for we have practically defined happiness as a sort of good life and good action. The characteristics that are looked for in happiness seem also, all of them, to belong to what we have defined happiness as being. For some identify happiness with virtue, some with practical wisdom, others with a kind of philosophic wisdom, others with these, or one of these, accompanied by pleasure or not without pleasure; while others include also external prosperity. Now some of these views have been held by many men and men of old, others by a few eminent persons; and it is not probable that either of these should be entirely mistaken, but rather that they should be right in at least some one respect or even in most respects.

With those who identify happiness with virtue or some one virtue our account is in harmony; for to virtue belongs virtuous activity. But it makes, perhaps, no small difference whether we place the chief good in possession or in use, in state of mind or in activity. For the state of mind may exist without producing any good result, as in a man who is asleep or in some other way quite inactive, but the activity cannot; for one who has the activity will of necessity be acting, and acting well. And as in the Olympic Games it is not the most beautiful and the strongest that are crowned but those who compete (for it is some of these that are victorious), so those who act win, and rightly win, the noble and good things in life.

Their life is also in itself pleasant. For pleasure is a state of soul, and to each man that which he is said to be a lover of is pleasant; e.g. not only is a horse pleasant to the lover of horses, and a spectacle to the lover of sights, but also in the same way just acts are pleasant to the lover of justice and in general virtuous acts to the lover of virtue. Now for most men their pleasures are in conflict with one another because these are not by nature pleasant, but the lovers of what is noble find pleasant the things that are by nature pleasant; and virtuous actions are such, so that these are pleasant for such men as well as in their own nature. Their life, therefore, has no further need of pleasure as a sort of adventitious charm, but has its pleasure in itself. For, besides what we have said, the man who does not rejoice in noble actions is not even good; since no one would call a man just who did not enjoy acting justly, nor any man liberal who did not enjoy liberal actions; and similarly in all other cases. If this is so, virtuous actions must be in themselves pleasant. But they are also good and noble, and have each of these attributes in the highest degree, since the good man judges well about these attributes; his judgement is such as we have described. Happiness then is the best, noblest, and most pleasant thing in the world, and these attributes are not severed as in the inscription at Delos:

Most noble is that which is justest, and best is health;

But pleasantest is it to win what we love.

For all these properties belong to the best activities; and these, or one – the best – of these, we identify with happiness.

Yet evidently, as we said, it needs the external goods as well; for it is impossible, or not easy, to do noble acts without the proper equipment. In many actions we use friends and riches and political power as instruments; and there are some things the lack of which takes the lustre from happiness, as good birth,

goodly children, beauty; for the man who is very ugly in appearance or ill-born or solitary and childless is not very likely to be happy, and perhaps a man would be still less likely if he had thoroughly bad children or friends or had lost good children or friends by death. As we said, then, happiness seems to need this sort of prosperity in addition; for which reason some identify happiness with good fortune, though others identify it with virtue.

9

For this reason also the question is asked, whether happiness is to be acquired by learning or by habituation or some other sort of training, or comes in virtue of some divine providence or again by chance. Now if there is any gift of the gods to men, it is reasonable that happiness should be god-given, and most surely god-given of all human things inasmuch as it is the best. But this question would perhaps be more appropriate to another inquiry; happiness seems, however, even if it is not god-sent but comes as a result of virtue and some process of learning or training, to be among the most godlike things; for that which is the prize and end of virtue seems to be the best thing in the world, and something godlike and blessed.

It will also on this view be very generally shared; for all who are not maimed as regards their potentiality for virtue may win it by a certain kind of study and care. But if it is better to be happy thus than by chance, it is reasonable that the facts should be so, since everything that depends on the action of nature is by nature as good as it can be, and similarly everything that depends on art or any rational cause, and especially if it

depends on the best of all causes. To entrust to chance what is greatest and most noble would be a very defective arrangement.

The answer to the question we are asking is plain also from the definition of happiness; for it has been said to be a virtuous activity of soul, of a certain kind. Of the remaining goods, some must necessarily pre-exist as conditions of happiness, and others are naturally co-operative and useful as instruments. And this will be found to agree with what we said at the outset; for we stated the end of political science to be the best end, and political science spends most of its pains on making the citizens to be of a certain character, viz. good and capable of noble acts.

It is natural, then, that we call neither ox nor horse nor any other of the animals happy; for none of them is capable of sharing in such activity. For this reason also a boy is not happy; for he is not yet capable of such acts, owing to his age; and boys who are called happy are being congratulated by reason of the hopes we have for them. For there is required, as we said, not only complete virtue but also a complete life, since many changes occur in life, and all manner of chances, and the most prosperous may fall into great misfortunes in old age, as is told of Priam in the Trojan Cycle; and one who has experienced such chances and has ended wretchedly no one calls happy.

10

Must no one at all, then, be called happy while he lives; must we, as Solon says, see the end? Even if we are to lay down this doctrine, is it also the case that a man is happy when he is dead? Or is not this quite absurd, especially for us who say that happiness is an activity? But if we do not call the dead man happy, and if Solon does not mean this, but that one can then

safely call a man blessed as being at last beyond evils and misfortunes, this also affords matter for discussion; for both evil and good are thought to exist for a dead man, as much as for one who is alive but not aware of them; e.g. honours and dishonours and the good or bad fortunes of children and in general of descendants. And this also presents a problem; for though a man has lived happily up to old age and has had a death worthy of his life, many reverses may befall his descendants – some of them may be good and attain the life they deserve, while with others the opposite may be the case; and clearly too the degrees of relationship between them and their ancestors may vary indefinitely. It would be odd, then, if the dead man were to share in these changes and become at one time happy, at another wretched; while it would also be odd if the fortunes of the descendants did not for some time have some effect on the happiness of their ancestors.

But we must return to our first difficulty; for perhaps by a consideration of it our present problem might be solved. Now if we must see the end and only then call a man happy, not as being happy but as having been so before, surely this is a paradox, that when he is happy the attribute that belongs to him is not to be truly predicated of him because we do not wish to call living men happy, on account of the changes that may befall them, and because we have assumed happiness to be something permanent and by no means easily changed, while a single man may suffer many turns of fortune's wheel. For clearly if we were to keep pace with his fortunes, we should often call the same man happy and again wretched, making the happy man out to be chameleon and insecurely based. Or is this keeping pace with his fortunes quite wrong? Success or failure in life does not depend on these, but human life, as we said, needs these as mere additions, while virtuous activities or their opposites are what constitute happiness or the reverse.

The question we have now discussed confirms our definition. For no function of man has so much permanence as virtuous activities (these are thought to be more durable even than knowledge of the sciences), and of these themselves the most valuable are more durable because those who are happy spend their life most readily and most continuously in these; for this seems to be the reason why we do not forget them. The attribute in question, then, will belong to the happy man, and he will be happy throughout his life; for always, or by preference to everything else, he will be engaged in virtuous action and contemplation, and he will bear the chances of life most nobly and altogether decorously, if he is 'truly good' and 'foursquare beyond reproach'.

Now many events happen by chance, and events differing in importance; small pieces of good fortune or of its opposite clearly do not weigh down the scales of life one way or the other, but a multitude of great events if they turn out well will make life happier (for not only are they themselves such as to add beauty to life, but the way a man deals with them may be noble and good), while if they turn out ill they crush and maim happiness; for they both bring pain with them and hinder many activities. Yet even in these nobility shines through, when a man bears with resignation many great misfortunes, not through insensibility to pain but through nobility and greatness of soul.

If activities are, as we said, what gives life its character, no happy man can become miserable; for he will never do the acts that are hateful and mean. For the man who is truly good and wise, we think, bears all the chances life becomingly and always makes the best of circumstances, as a good general makes the best military use of the army at his command and a good shoemaker makes the best shoes out of the hides that are given him; and so with all other craftsmen. And if this is the case, the

happy man can never become miserable; though he will not reach blessedness, if he meet with fortunes like those of Priam.

Nor, again, is he many-coloured and changeable; for neither will he be moved from his happy state easily or by any ordinary misadventures, but only by many great ones, nor, if he has had many great misadventures, will he recover his happiness in a short time, but if at all, only in a long and complete one in which he has attained many splendid successes.

When then should we not say that he is happy who is active in accordance with complete virtue and is sufficiently equipped with external goods, not for some chance period but throughout a complete life? Or must we add 'and who is destined to live thus and die as befits his life'? Certainly the future is obscure to us, while happiness, we claim, is an end and something in every way final. If so, we shall call happy those among living men in whom these conditions are, and are to be, fulfilled – but happy men. So much for these questions.

11

That the fortunes of descendants and of all a man's friends should not affect his happiness at all seems a very unfriendly doctrine, and one opposed to the opinions men hold; but since the events that happen are numerous and admit of all sorts of difference, and some come more near to us and others less so, it seems a long – nay, an infinite – task to discuss each in detail; a general outline will perhaps suffice. If, then, as some of a man's own misadventures have a certain weight and influence on life while others are, as it were, lighter, so too there are differences among the misadventures of our friends taken as a whole, and it makes a difference whether the various suffering befall the

living or the dead (much more even than whether lawless and terrible deeds are presupposed in a tragedy or done on the stage), this difference also must be taken into account; or rather, perhaps, the fact that doubt is felt whether the dead share in any good or evil. For it seems, from these considerations, that even if anything whether good or evil penetrates to them, it must be something weak and negligible, either in itself or for them, or if not, at least it must be such in degree and kind as not to make happy those who are not happy nor to take away their blessedness from those who are. The good or bad fortunes of friends, then, seem to have some effects on the dead, but effects of such a kind and degree as neither to make the happy unhappy nor to produce any other change of the kind.

12

These questions having been definitely answered, let us consider whether happiness is among the things that are praised or rather among the things that are prized; for clearly it is not to be placed among potentialities. Everything that is praised seems to be praised because it is of a certain kind and is related somehow to something else; for we praise the just or brave man and in general both the good man and virtue itself because of the actions and functions involved, and we praise the strong man, the good runner, and so on, because he is of a certain kind and is related in a certain way to something good and important. This is clear also from the praises of the gods; for it seems absurd that the gods should be referred to our standard, but this is done because praise involves a reference, to something else. But if if praise is for things such as we have described, clearly what applies to the best things is not praise, but something greater and better, as is indeed obvious; for what

we do to the gods and the most godlike of men is to call them blessed and happy. And so too with good things; no one praises happiness as he does justice, but rather calls it blessed, as being something more divine and better.

Eudoxus also seems to have been right in his method of advocating the supremacy of pleasure; he thought that the fact that, though a good, it is not praised indicated it to be better than the things that are praised, and that this is what God and the good are; for by reference to these all other things are judged. Praise is appropriate to virtue, for as a result of virtue men tend to do noble deeds, but encomia are bestowed on acts, whether of the body or of the soul. But perhaps nicety in these matters is more proper to those who have made a study of encomia; to us it is clear from what has been said that happiness is among the things that are prized and perfect. It seems to be so also from the fact that it is a first principle; for it is for the sake of this that we all do all that we do, and the first principle and cause of goods is, we claim, something prized and divine.

13

Since happiness is an activity of soul in accordance with perfect virtue, we must consider the nature of virtue; for perhaps we shall thus see better the nature of happiness. The true student of politics, too, is thought to have studied virtue above all things; for he wishes to make his fellow citizens good and obedient to the laws. As an example of this we have the lawgivers of the Cretans and the Spartans, and any others of the kind that there may have been. And if this inquiry belongs to political science, clearly the pursuit of it will be in accordance

with our original plan. But clearly the virtue we must study is human virtue; for the good we were seeking was human good and the happiness human happiness. By human virtue we mean not that of the body but that of the soul; and happiness also we call an activity of soul. But if this is so, clearly the student of politics must know somehow the facts about soul, as the man who is to heal the eyes or the body as a whole must know about the eyes or the body; and all the more since politics is more prized and better than medicine; but even among doctors the best educated spend much labour on acquiring knowledge of the body. The student of politics, then, must study the soul, and must study it with these objects in view, and do so just to the extent which is sufficient for the questions we are discussing; for further precision is perhaps something more laborious than our purposes require.

Some things are said about it, adequately enough, even in the discussions outside our school, and we must use these; e.g. that one element in the soul is irrational and one has a rational principle. Whether these are separated as the parts of the body or of anything divisible are, or are distinct by definition but by nature inseparable, like convex and concave in the circumference of a circle, does not affect the present question.

Of the irrational element one division seems to be widely distributed, and vegetative in its nature, I mean that which causes nutrition and growth; for it is this kind of power of the soul that one must assign to all nurslings and to embryos, and this same power to fullgrown creatures; this is more reasonable than to assign some different power to them. Now the excellence of this seems to be common to all species and not specifically human; for this part or faculty seems to function most in sleep, while goodness and badness are least manifest in sleep (whence comes the saying that the happy are not better off than the wretched for half their lives; and this happens

naturally enough, since sleep is an inactivity of the soul in that respect in which it is called good or bad), unless perhaps to a small extent some of the movements actually penetrate to the soul, and in this respect the dreams of good men are better than those of ordinary people. Enough of this subject, however; let us leave the nutritive faculty alone, since it has by its nature no share in human excellence.

There seems to be also another irrational element in the soul-one which in a sense, however, shares in a rational principle. For we praise the rational principle of the continent man and of the incontinent, and the part of their soul that has such a principle, since it urges them aright and towards the best objects; but there is found in them also another element naturally opposed to the rational principle, which fights against and resists that principle. For exactly as paralysed limbs when we intend to move them to the right turn on the contrary to the left, so is it with the soul; the impulses of incontinent people move in contrary directions. But while in the body we see that which moves astray, in the soul we do not. No doubt, however, we must none the less suppose that in the soul too there is something contrary to the rational principle, resisting and opposing it. In what sense it is distinct from the other elements does not concern us. Now even this seems to have a share in a rational principle, as we said; at any rate in the continent man it obeys the rational principle and presumably in the temperate and brave man it is still more obedient; for in him it speaks, on all matters, with the same voice as the rational principle.

Therefore the irrational element also appears to be two-fold. For the vegetative element in no way shares in a rational principle, but the appetitive and in general the desiring element in a sense shares in it, in so far as it listens to and obeys it; this is the sense in which we speak of 'taking account' of one's father or one's friends, not that in which we speak of 'accounting for a

mathematical property. That the irrational element is in some sense persuaded by a rational principle is indicated also by the giving of advice and by all reproof and exhortation. And if this element also must be said to have a rational principle, that which has a rational principle (as well as that which has not) will be twofold, one subdivision having it in the strict sense and in itself, and the other having a tendency to obey as one does one's father.

Virtue too is distinguished into kinds in accordance with this difference; for we say that some of the virtues are intellectual and others moral, philosophic wisdom and understanding and practical wisdom being intellectual, liberality and temperance moral. For in speaking about a man's character we do not say that he is wise or has understanding but that he is good-tempered or temperate; yet we praise the wise man also with respect to his state of mind; and of states of mind we call those which merit praise virtues.

Book II

1

Virtue, then, being of two kinds, intellectual and moral, intellectual virtue in the main owes both its birth and its growth to teaching (for which reason it requires experience and time), while moral virtue comes about as a result of habit, whence also its name (ethike) is one that is formed by a slight variation from

the word ethos (habit). From this it is also plain that none of the moral virtues arises in us by nature; for nothing that exists by nature can form a habit contrary to its nature. For instance the stone which by nature moves downwards cannot be habituated to move upwards, not even if one tries to train it by throwing it up ten thousand times; nor can fire be habituated to move downwards, nor can anything else that by nature behaves in one way be trained to behave in another. Neither by nature, then, nor contrary to nature do the virtues arise in us; rather we are adapted by nature to receive them, and are made perfect by habit.

Again, of all the things that come to us by nature we first acquire the potentiality and later exhibit the activity (this is plain in the case of the senses; for it was not by often seeing or often hearing that we got these senses, but on the contrary we had them before we used them, and did not come to have them by using them); but the virtues we get by first exercising them, as also happens in the case of the arts as well. For the things we have to learn before we can do them, we learn by doing them, e.g. men become builders by building and lyreplayers by playing the lyre; so too we become just by doing just acts, temperate by doing temperate acts, brave by doing brave acts.

This is confirmed by what happens in states; for legislators make the citizens good by forming habits in them, and this is the wish of every legislator, and those who do not effect it miss their mark, and it is in this that a good constitution differs from a bad one.

Again, it is from the same causes and by the same means that every virtue is both produced and destroyed, and similarly every art; for it is from playing the lyre that both good and bad lyre-players are produced. And the corresponding statement is true of builders and of all the rest; men will be good or bad builders

as a result of building well or badly. For if this were not so, there would have been no need of a teacher, but all men would have been born good or bad at their craft. This, then, is the case with the virtues also; by doing the acts that we do in our transactions with other men we become just or unjust, and by doing the acts that we do in the presence of danger, and being habituated to feel fear or confidence, we become brave or cowardly. The same is true of appetites and feelings of anger; some men become temperate and good-tempered, others self-indulgent and irascible, by behaving in one way or the other in the appropriate circumstances. Thus, in one word, states of character arise out of like activities. This is why the activities we exhibit must be of a certain kind; it is because the states of character correspond to the differences between these. It makes no small difference, then, whether we form habits of one kind or of another from our very youth; it makes a very great difference, or rather all the difference.

2

Since, then, the present inquiry does not aim at theoretical knowledge like the others (for we are inquiring not in order to know what virtue is, but in order to become good, since otherwise our inquiry would have been of no use), we must examine the nature of actions, namely how we ought to do them; for these determine also the nature of the states of character that are produced, as we have said. Now, that we must act according to the right rule is a common principle and must be assumed – it will be discussed later, i.e. both what the right rule is, and how it is related to the other virtues. But this must be agreed upon beforehand, that the whole account of matters of conduct must be given in outline and not precisely, as we

said at the very beginning that the accounts we demand must be in accordance with the subject-matter; matters concerned with conduct and questions of what is good for us have no fixity, any more than matters of health. The general account being of this nature, the account of particular cases is yet more lacking in exactness; for they do not fall under any art or precept but the agents themselves must in each case consider what is appropriate to the occasion, as happens also in the art of medicine or of navigation.

But though our present account is of this nature we must give what help we can. First, then, let us consider this, that it is the nature of such things to be destroyed by defect and excess, as we see in the case of strength and of health (for to gain light on things imperceptible we must use the evidence of sensible things); both excessive and defective exercise destroys the strength, and similarly drink or food which is above or below a certain amount destroys the health, while that which is proportionate both produces and increases and preserves it. So too is it, then, in the case of temperance and courage and the other virtues. For the man who flies from and fears everything and does not stand his ground against anything becomes a coward, and the man who fears nothing at all but goes to meet every danger becomes rash; and similarly the man who indulges in every pleasure and abstains from none becomes self-indulgent, while the man who shuns every pleasure, as boors do, becomes in a way insensible; temperance and courage, then, are destroyed by excess and defect, and preserved by the mean.

But not only are the sources and causes of their origination and growth the same as those of their destruction, but also the sphere of their actualization will be the same; for this is also true of the things which are more evident to sense, e.g. of strength; it is produced by taking much food and undergoing

much exertion, and it is the strong man that will be most able to do these things. So too is it with the virtues; by abstaining from pleasures we become temperate, and it is when we have become so that we are most able to abstain from them; and similarly too in the case of courage; for by being habituated to despise things that are terrible and to stand our ground against them we become brave, and it is when we have become so that we shall be most able to stand our ground against them.

3

We must take as a sign of states of character the pleasure or pain that ensues on acts; for the man who abstains from bodily pleasures and delights in this very fact is temperate, while the man who is annoyed at it is self-indulgent, and he who stands his ground against things that are terrible and delights in this or at least is not pained is brave, while the man who is pained is a coward. For moral excellence is concerned with pleasures and pains; it is on account of the pleasure that we do bad things, and on account of the pain that we abstain from noble ones. Hence we ought to have been brought up in a particular way from our very youth, as Plato says, so as both to delight in and to be pained by the things that we ought; for this is the right education.

Again, if the virtues are concerned with actions and passions, and every passion and every action is accompanied by pleasure and pain, for this reason also virtue will be concerned with pleasures and pains. This is indicated also by the fact that punishment is inflicted by these means; for it is a kind of cure, and it is the nature of cures to be effected by contraries.

Again, as we said but lately, every state of soul has a nature relative to and concerned with the kind of things by which it tends to be made worse or better; but it is by reason of pleasures and pains that men become bad, by pursuing and avoiding these – either the pleasures and pains they ought not or when they ought not or as they ought not, or by going wrong in one of the other similar ways that may be distinguished. Hence men even define the virtues as certain states of impassivity and rest; not well, however, because they speak absolutely, and do not say 'as one ought' and 'as one ought not' and 'when one ought or ought not', and the other things that may be added. We assume, then, that this kind of excellence tends to do what is best with regard to pleasures and pains, and vice does the contrary.

The following facts also may show us that virtue and vice are concerned with these same things. There being three objects of choice and three of avoidance, the noble, the advantageous, the pleasant, and their contraries, the base, the injurious, the painful, about all of these the good man tends to go right and the bad man to go wrong, and especially about pleasure; for this is common to the animals, and also it accompanies all objects of choice; for even the noble and the advantageous appear pleasant.

Again, it has grown up with us all from our infancy; this is why it is difficult to rub off this passion, engrained as it is in our life. And we measure even our actions, some of us more and others less, by the rule of pleasure and pain. For this reason, then, our whole inquiry must be about these; for to feel delight and pain rightly or wrongly has no small effect on our actions.

Again, it is harder to fight with pleasure than with anger, to use Heraclitus' phrase', but both art and virtue are always concerned with what is harder; for even the good is better when

it is harder. Therefore for this reason also the whole concern both of virtue and of political science is with pleasures and pains; for the man who uses these well will be good, he who uses them badly bad.

That virtue, then, is concerned with pleasures and pains, and that by the acts from which it arises it is both increased and, if they are done differently, destroyed, and that the acts from which it arose are those in which it actualizes itself – let this be taken as said.

4

The question might be asked,; what we mean by saying that we must become just by doing just acts, and temperate by doing temperate acts; for if men do just and temperate acts, they are already just and temperate, exactly as, if they do what is in accordance with the laws of grammar and of music, they are grammarians and musicians.

Or is this not true even of the arts? It is possible to do something that is in accordance with the laws of grammar, either by chance or at the suggestion of another. A man will be a grammarian, then, only when he has both done something grammatical and done it grammatically; and this means doing it in accordance with the grammatical knowledge in himself.

Again, the case of the arts and that of the virtues are not similar; for the products of the arts have their goodness in themselves, so that it is enough that they should have a certain character, but if the acts that are in accordance with the virtues have themselves a certain character it does not follow that they are done justly or temperately. The agent also must be in a

certain condition when he does them; in the first place he must have knowledge, secondly he must choose the acts, and choose them for their own sakes, and thirdly his action must proceed from a firm and unchangeable character. These are not reckoned in as conditions of the possession of the arts, except the bare knowledge; but as a condition of the possession of the virtues knowledge has little or no weight, while the other conditions count not for a little but for everything, i.e. the very conditions which result from often doing just and temperate acts.

Actions, then, are called just and temperate when they are such as the just or the temperate man would do; but it is not the man who does these that is just and temperate, but the man who also does them as just and temperate men do them. It is well said, then, that it is by doing just acts that the just man is produced, and by doing temperate acts the temperate man; without doing these no one would have even a prospect of becoming good.

But most people do not do these, but take refuge in theory and think they are being philosophers and will become good in this way, behaving somewhat like patients who listen attentively to their doctors, but do none of the things they are ordered to do. As the latter will not be made well in body by such a course of treatment, the former will not be made well in soul by such a course of philosophy.

5

Next we must consider what virtue is. Since things that are found in the soul are of three kinds – passions, faculties, states of character, virtue must be one of these. By passions I mean

appetite, anger, fear, confidence, envy, joy, friendly feeling, hatred, longing, emulation, pity, and in general the feelings that are accompanied by pleasure or pain; by faculties the things in virtue of which we are said to be capable of feeling these, e.g. of becoming angry or being pained or feeling pity; by states of character the things in virtue of which we stand well or badly with reference to the passions, e.g. with reference to anger we stand badly if we feel it violently or too weakly, and well if we feel it moderately; and similarly with reference to the other passions.

Now neither the virtues nor the vices are passions, because we are not called good or bad on the ground of our passions, but are so called on the ground of our virtues and our vices, and because we are neither praised nor blamed for our passions (for the man who feels fear or anger is not praised, nor is the man who simply feels anger blamed, but the man who feels it in a certain way), but for our virtues and our vices we are praised or blamed.

Again, we feel anger and fear without choice, but the virtues are modes of choice or involve choice. Further, in respect of the passions we are said to be moved, but in respect of the virtues and the vices we are said not to be moved but to be disposed in a particular way.

For these reasons also they are not faculties; for we are neither called good nor bad, nor praised nor blamed, for the simple capacity of feeling the passions; again, we have the faculties by nature, but we are not made good or bad by nature; we have spoken of this before. If, then, the virtues are neither passions nor faculties, all that remains is that they should be states of character.

Thus we have stated what virtue is in respect of its genus.

6

We must, however, not only describe virtue as a state of character, but also say what sort of state it is. We may remark, then, that every virtue or excellence both brings into good condition the thing of which it is the excellence and makes the work of that thing be done well; e.g. the excellence of the eye makes both the eye and its work good; for it is by the excellence of the eye that we see well. Similarly the excellence of the horse makes a horse both good in itself and good at running and at carrying its rider and at awaiting the attack of the enemy. Therefore, if this is true in every case, the virtue of man also will be the state of character which makes a man good and which makes him do his own work well.

How this is to happen we have stated already, but it will be made plain also by the following consideration of the specific nature of virtue. In everything that is continuous and divisible it is possible to take more, less, or an equal amount, and that either in terms of the thing itself or relatively to us; and the equal is an intermediate between excess and defect. By the intermediate in the object I mean that which is equidistant from each of the extremes, which is one and the same for all men; by the intermediate relatively to us that which is neither too much nor too little – and this is not one, nor the same for all. For instance, if ten is many and two is few, six is the intermediate, taken in terms of the object; for it exceeds and is exceeded by an equal amount; this is intermediate according to arithmetical proportion. But the intermediate relatively to us is not to be taken so; if ten pounds are too much for a particular person to eat and two too little, it does not follow that the trainer will order six pounds; for this also is perhaps too much

for the person who is to take it, or too little – too little for Milo, too much for the beginner in athletic exercises. The same is true of running and wrestling. Thus a master of any art avoids excess and defect, but seeks the intermediate and chooses this – the intermediate not in the object but relatively to us.

If it is thus, then, that every art does its work well – by looking to the intermediate and judgling its works by this standard (so that we often say of good works of art that it is not possible either to take away or to add anything, implying that excess and defect destroy the goodness of works of art, while the mean preserves it; and good artists, as we say, look to this in their work), and if, further, virtue is more exact and better than any art, as nature also is, then virtue must have the quality of aiming at the intermediate. I mean moral virtue; for it is this that is concerned with passions and actions, and in these there is excess, defect, and the intermediate. For instance, both fear and confidence and appetite and anger and pity and in general pleasure and pain may be felt both too much and too little, and in both cases not well; but to feel them at the right times, with reference to the right objects, towards the right people, with the right motive, and in the right way, is what is both intermediate and best, and this is characteristic of virtue. Similarly with regard to actions also there is excess, defect, and the intermediate. Now virtue is concerned with passions and actions, in which excess is a form of failure, and so is defect, while the intermediate is praised and is a form of success; and being praised and being successful are both characteristics of virtue. Therefore virtue is a kind of mean, since, as we have seen, it aims at what is intermediate.

Again, it is possible to fail in many ways (for evil belongs to the class of the unlimited, as the Pythagoreans conjectured, and good to that of the limited), while to succeed is possible only in one way (for which reason also one is easy and the other

difficult – to miss the mark easy, to hit it difficult); for these reasons also, then, excess and defect are characteristic of vice, and the mean of virtue;

For men are good in but one way, but bad in many.

Virtue, then, is a state of character concerned with choice, lying in a mean, i.e. the mean relative to us, this being determined by a rational principle, and by that principle by which the man of practical wisdom would determine it. Now it is a mean between two vices, that which depends on excess and that which depends on defect; and again it is a mean because the vices respectively fall short of or exceed what is right in both passions and actions, while virtue both finds and chooses that which is intermediate. Hence in respect of its substance and the definition which states its essence virtue is a mean, with regard to what is best and right an extreme.

But not every action nor every passion admits of a mean; for some have names that already imply badness, e.g. spite, shamelessness, envy, and in the case of actions adultery, theft, murder; for all of these and suchlike things imply by their names that they are themselves bad, and not the excesses or deficiencies of them. It is not possible, then, ever to be right with regard to them; one must always be wrong. Nor does goodness or badness with regard to such things depend on committing adultery with the right woman, at the right time, and in the right way, but simply to do any of them is to go wrong. It would be equally absurd, then, to expect that in unjust, cowardly, and voluptuous action there should be a mean, an excess, and a deficiency; for at that rate there would be a mean of excess and of deficiency, an excess of excess, and a deficiency of deficiency. But as there is no excess and deficiency of temperance and courage because what is intermediate is in a sense an extreme, so too of the actions we

have mentioned there is no mean nor any excess and deficiency, but however they are done they are wrong; for in general there is neither a mean of excess and deficiency, nor excess and deficiency of a mean.

7

We must, however, not only make this general statement, but also apply it to the individual facts. For among statements about conduct those which are general apply more widely, but those which are particular are more genuine, since conduct has to do with individual cases, and our statements must harmonize with the facts in these cases. We may take these cases from our table. With regard to feelings of fear and confidence courage is the mean; of the people who exceed, he who exceeds in fearlessness has no name (many of the states have no name), while the man who exceeds in confidence is rash, and he who exceeds in fear and falls short in confidence is a coward. With regard to pleasures and pains – not all of them, and not so much with regard to the pains – the mean is temperance, the excess self-indulgence. Persons deficient with regard to the pleasures are not often found; hence such persons also have received no name. But let us call them 'insensible'.

With regard to giving and taking of money the mean is liberality, the excess and the defect prodigality and meanness. In these actions people exceed and fall short in contrary ways; the prodigal exceeds in spending and falls short in taking, while the mean man exceeds in taking and falls short in spending. (At present we are giving a mere outline or summary, and are satisfied with this; later these states will be more exactly determined.) With regard to money there are also other

dispositions – a mean, magnificence (for the magnificent man differs from the liberal man; the former deals with large sums, the latter with small ones), an excess, tastelessness and vulgarity, and a deficiency, niggardliness; these differ from the states opposed to liberality, and the mode of their difference will be stated later. With regard to honour and dishonour the mean is proper pride, the excess is known as a sort of 'empty vanity', and the deficiency is undue humility; and as we said liberality was related to magnificence, differing from it by dealing with small sums, so there is a state similarly related to proper pride, being concerned with small honours while that is concerned with great. For it is possible to desire honour as one ought, and more than one ought, and less, and the man who exceeds in his desires is called ambitious, the man who falls short unambitious, while the intermediate person has no name. The dispositions also are nameless, except that that of the ambitious man is called ambition. Hence the people who are at the extremes lay claim to the middle place; and we ourselves sometimes call the intermediate person ambitious and sometimes unambitious, and sometimes praise the ambitious man and sometimes the unambitious. The reason of our doing this will be stated in what follows; but now let us speak of the remaining states according to the method which has been indicated.

With regard to anger also there is an excess, a deficiency, and a mean. Although they can scarcely be said to have names, yet since we call the intermediate person good-tempered let us call the mean good temper; of the persons at the extremes let the one who exceeds be called irascible, and his vice irascibility, and the man who falls short an inirascible sort of person, and the deficiency inirascibility.

There are also three other means, which have a certain likeness to one another, but differ from one another: for they are all

concerned with intercourse in words and actions, but differ in that one is concerned with truth in this sphere, the other two with pleasantness; and of this one kind is exhibited in giving amusement, the other in all the circumstances of life. We must therefore speak of these too, that we may the better see that in all things the mean is praise-worthy, and the extremes neither praiseworthy nor right, but worthy of blame. Now most of these states also have no names, but we must try, as in the other cases, to invent names ourselves so that we may be clear and easy to follow. With regard to truth, then, the intermediate is a truthful sort of person and the mean may be called truthfulness, while the pretence which exaggerates is boastfulness and the person characterized by it a boaster, and that which understates is mock modesty and the person characterized by it mock-modest. With regard to pleasantness in the giving of amusement the intermediate person is ready-witted and the disposition ready wit, the excess is buffoonery and the person characterized by it a buffoon, while the man who falls short is a sort of boor and his state is boorishness. With regard to the remaining kind of pleasantness, that which is exhibited in life in general, the man who is pleasant in the right way is friendly and the mean is friendliness, while the man who exceeds is an obsequious person if he has no end in view, a flatterer if he is aiming at his own advantage, and the man who falls short and is unpleasant in all circumstances is a quarrelsome and surly sort of person.

There are also means in the passions and concerned with the passions; since shame is not a virtue, and yet praise is extended to the modest man. For even in these matters one man is said to be intermediate, and another to exceed, as for instance the bashful man who is ashamed of everything; while he who falls short or is not ashamed of anything at all is shameless, and the intermediate person is modest. Righteous indignation is a mean between envy and spite, and these states are concerned with

the pain and pleasure that are felt at the fortunes of our neighbours; the man who is characterized by righteous indignation is pained at undeserved good fortune, the envious man, going beyond him, is pained at all good fortune, and the spiteful man falls so far short of being pained that he even rejoices. But these states there will be an opportunity of describing elsewhere; with regard to justice, since it has not one simple meaning, we shall, after describing the other states, distinguish its two kinds and say how each of them is a mean; and similarly we shall treat also of the rational virtues.

8

There are three kinds of disposition, then, two of them vices, involving excess and deficiency respectively, and one a virtue, viz. the mean, and all are in a sense opposed to all; for the extreme states are contrary both to the intermediate state and to each other, and the intermediate to the extremes; as the equal is greater relatively to the less, less relatively to the greater, so the middle states are excessive relatively to the deficiencies, deficient relatively to the excesses, both in passions and in actions. For the brave man appears rash relatively to the coward, and cowardly relatively to the rash man; and similarly the temperate man appears self-indulgent relatively to the insensible man, insensible relatively to the self-indulgent, and the liberal man prodigal relatively to the mean man, mean relatively to the prodigal. Hence also the people at the extremes push the intermediate man each over to the other, and the brave man is called rash by the coward, cowardly by the rash man, and correspondingly in the other cases.

These states being thus opposed to one another, the greatest contrariety is that of the extremes to each other, rather than to the intermediate; for these are further from each other than from the intermediate, as the great is further from the small and the small from the great than both are from the equal. Again, to the intermediate some extremes show a certain likeness, as that of rashness to courage and that of prodigality to liberality; but the extremes show the greatest unlikeness to each other; now contraries are defined as the things that are furthest from each other, so that things that are further apart are more contrary.

To the mean in some cases the deficiency, in some the excess is more opposed; e.g. it is not rashness, which is an excess, but cowardice, which is a deficiency, that is more opposed to courage, and not insensibility, which is a deficiency, but self-indulgence, which is an excess, that is more opposed to temperance. This happens from two reasons, one being drawn from the thing itself; for because one extreme is nearer and liker to the intermediate, we oppose not this but rather its contrary to the intermediate. E.g. since rashness is thought liker and nearer to courage, and cowardice more unlike, we oppose rather the latter to courage; for things that are further from the intermediate are thought more contrary to it. This, then, is one cause, drawn from the thing itself; another is drawn from ourselves; for the things to which we ourselves more naturally tend seem more contrary to the intermediate. For instance, we ourselves tend more naturally to pleasures, and hence are more easily carried away towards self-indulgence than towards propriety. We describe as contrary to the mean, then, rather the directions in which we more often go to great lengths; and therefore self-indulgence, which is an excess, is the more contrary to temperance.

9

That moral virtue is a mean, then, and in what sense it is so, and that it is a mean between two vices, the one involving excess, the other deficiency, and that it is such because its character is to aim at what is intermediate in passions and in actions, has been sufficiently stated. Hence also it is no easy task to be good. For in everything it is no easy task to find the middle, e.g. to find the middle of a circle is not for every one but for him who knows; so, too, any one can get angry – that is easy – or give or spend money; but to do this to the right person, to the right extent, at the right time, with the right motive, and in the right way, that is not for every one, nor is it easy; wherefore goodness is both rare and laudable and noble.

Hence he who aims at the intermediate must first depart from what is the more contrary to it, as Calypso advises:

Hold the ship out beyond that surf and spray.

For of the extremes one is more erroneous, one less so; therefore, since to hit the mean is hard in the extreme, we must as a second best, as people say, take the least of the evils; and this will be done best in the way we describe. But we must consider the things towards which we ourselves also are easily carried away; for some of us tend to one thing, some to another; and this will be recognizable from the pleasure and the pain we feel. We must drag ourselves away to the contrary extreme; for we shall get into the intermediate state by drawing well away from error, as people do in straightening sticks that are bent.

Now in everything the pleasant or pleasure is most to be guarded against; for we do not judge it impartially. We ought, then, to feel towards pleasure as the elders of the people felt towards Helen, and in all circumstances repeat their saying; for

if we dismiss pleasure thus we are less likely to go astray. It is by doing this, then, (to sum the matter up) that we shall best be able to hit the mean.

But this is no doubt difficult, and especially in individual cases; for or is not easy to determine both how and with whom and on what provocation and how long one should be angry; for we too sometimes praise those who fall short and call them good-tempered, but sometimes we praise those who get angry and call them manly. The man, however, who deviates little from goodness is not blamed, whether he do so in the direction of the more or of the less, but only the man who deviates more widely; for he does not fail to be noticed. But up to what point and to what extent a man must deviate before he becomes blameworthy it is not easy to determine by reasoning, any more than anything else that is perceived by the senses; such things depend on particular facts, and the decision rests with perception. So much, then, is plain, that the intermediate state is in all things to be praised, but that we must incline sometimes towards the excess, sometimes towards the deficiency; for so shall we most easily hit the mean and what is right.

Book III

1

Since virtue is concerned with passions and actions, and on voluntary passions and actions praise and blame are bestowed, on those that are involuntary pardon, and sometimes also pity, to distinguish the voluntary and the involuntary is presumably necessary for those who are studying the nature of virtue, and useful also for legislators with a view to the assigning both of honours and of punishments. Those things, then, are thought-involuntary, which take place under compulsion or owing to ignorance; and that is compulsory of which the moving principle is outside, being a principle in which nothing is contributed by the person who is acting or is feeling the passion, e.g. if he were to be carried somewhere by a wind, or by men who had him in their power.

But with regard to the things that are done from fear of greater evils or for some noble object (e.g. if a tyrant were to order one to do something base, having one's parents and children in his power, and if one did the action they were to be saved, but otherwise would be put to death), it may be debated whether such actions are involuntary or voluntary. Something of the sort happens also with regard to the throwing of goods overboard in a storm; for in the abstract no one throws goods away voluntarily, but on condition of its securing the safety of himself and his crew any sensible man does so. Such actions, then, are mixed, but are more like voluntary actions; for they are worthy of choice at the time when they are done, and the end of an action is relative to the occasion. Both the terms, then, 'voluntary' and 'involuntary', must be used with reference to the

moment of action. Now the man acts voluntarily; for the principle that moves the instrumental parts of the body in such actions is in him, and the things of which the moving principle is in a man himself are in his power to do or not to do. Such actions, therefore, are voluntary, but in the abstract perhaps involuntary; for no one would choose any such act in itself.

For such actions men are sometimes even praised, when they endure something base or painful in return for great and noble objects gained; in the opposite case they are blamed, since to endure the greatest indignities for no noble end or for a trifling end is the mark of an inferior person. On some actions praise indeed is not bestowed, but pardon is, when one does what he ought not under pressure which overstrains human nature and which no one could withstand. But some acts, perhaps, we cannot be forced to do, but ought rather to face death after the most fearful sufferings; for the things that 'forced' Euripides Alcmaeon to slay his mother seem absurd. It is difficult sometimes to determine what should be chosen at what cost, and what should be endured in return for what gain, and yet more difficult to abide by our decisions; for as a rule what is expected is painful, and what we are forced to do is base, whence praise and blame are bestowed on those who have been compelled or have not.

What sort of acts, then, should be called compulsory? We answer that without qualification actions are so when the cause is in the external circumstances and the agent contributes nothing. But the things that in themselves are involuntary, but now and in return for these gains are worthy of choice, and whose moving principle is in the agent, are in themselves involuntary, but now and in return for these gains voluntary. They are more like voluntary acts; for actions are in the class of particulars, and the particular acts here are voluntary. What sort

of things are to be chosen, and in return for what, it is not easy to state; for there are many differences in the particular cases.

But if some one were to say that pleasant and noble objects have a compelling power, forcing us from without, all acts would be for him compulsory; for it is for these objects that all men do everything they do. And those who act under compulsion and unwillingly act with pain, but those who do acts for their pleasantness and nobility do them with pleasure; it is absurd to make external circumstances responsible, and not oneself, as being easily caught by such attractions, and to make oneself responsible for noble acts but the pleasant objects responsible for base acts. The compulsory, then, seems to be that whose moving principle is outside, the person compelled contributing nothing.

Everything that is done by reason of ignorance is not voluntary; it is only what produces pain and repentance that is involuntary. For the man who has done something owing to ignorance, and feels not the least vexation at his action, has not acted voluntarily, since he did not know what he was doing, nor yet involuntarily, since he is not pained. Of people, then, who act by reason of ignorance he who repents is thought an involuntary agent, and the man who does not repent may, since he is different, be called a not voluntary agent; for, since he differs from the other, it is better that he should have a name of his own.

Acting by reason of ignorance seems also to be different from acting in ignorance; for the man who is drunk or in a rage is thought to act as a result not of ignorance but of one of the causes mentioned, yet not knowingly but in ignorance.

Now every wicked man is ignorant of what he ought to do and what he ought to abstain from, and it is by reason of error of this kind that men become unjust and in general bad; but the

term 'involuntary' tends to be used not if a man is ignorant of what is to his advantage – for it is not mistaken purpose that causes involuntary action (it leads rather to wickedness), nor ignorance of the universal (for that men are blamed), but ignorance of particulars, i.e. of the circumstances of the action and the objects with which it is concerned. For it is on these that both pity and pardon depend, since the person who is ignorant of any of these acts involuntarily.

Perhaps it is just as well, therefore, to determine their nature and number. A man may be ignorant, then, of who he is, what he is doing, what or whom he is acting on, and sometimes also what (e.g. what instrument) he is doing it with, and to what end (e.g. he may think his act will conduce to some one's safety), and how he is doing it (e.g. whether gently or violently). Now of all of these no one could be ignorant unless he were mad, and evidently also he could not be ignorant of the agent; for how could he not know himself? But of what he is doing a man might be ignorant, as for instance people say 'it slipped out of their mouths as they were speaking', or 'they did not know it was a secret', as Aeschylus said of the mysteries, or a man might say he 'let it go off when he merely wanted to show its working', as the man did with the catapult. Again, one might think one's son was an enemy, as Merope did, or that a pointed spear had a button on it, or that a stone was pumicestone; or one might give a man a draught to save him, and really kill him; or one might want to touch a man, as people do in sparring, and really wound him. The ignorance may relate, then, to any of these things, i.e. of the circumstances of the action, and the man who was ignorant of any of these is thought to have acted involuntarily, and especially if he was ignorant on the most important points; and these are thought to be the circumstances of the action and its end. Further, the doing of an act that is called involuntary in virtue of ignorance of this sort must be painful and involve repentance.

Since that which is done under compulsion or by reason of ignorance is involuntary, the voluntary would seem to be that of which the moving principle is in the agent himself, he being aware of the particular circumstances of the action. Presumably acts done by reason of anger or appetite are not rightly called involuntary. For in the first place, on that showing none of the other animals will act voluntarily, nor will children; and secondly, is it meant that we do not do voluntarily any of the acts that are due to appetite or anger, or that we do the noble acts voluntarily and the base acts involuntarily? Is not this absurd, when one and the same thing is the cause? But it would surely be odd to describe as involuntary the things one ought to desire; and we ought both to be angry at certain things and to have an appetite for certain things, e.g. for health and for learning. Also what is involuntary is thought to be painful, but what is in accordance with appetite is thought to be pleasant. Again, what is the difference in respect of involuntariness between errors committed upon calculation and those committed in anger? Both are to be avoided, but the irrational passions are thought not less human than reason is, and therefore also the actions which proceed from anger or appetite are the man's actions. It would be odd, then, to treat them as involuntary.

2

Both the voluntary and the involuntary having been delimited, we must next discuss choice; for it is thought to be most closely bound up with virtue and to discriminate characters better than actions do.

Choice, then, seems to be voluntary, but not the same thing as the voluntary; the latter extends more widely. For both children and the lower animals share in voluntary action, but not in choice, and acts done on the spur of the moment we describe as voluntary, but not as chosen.

Those who say it is appetite or anger or wish or a kind of opinion do not seem to be right. For choice is not common to irrational creatures as well, but appetite and anger are. Again, the incontinent man acts with appetite, but not with choice; while the continent man on the contrary acts with choice, but not with appetite. Again, appetite is contrary to choice, but not appetite to appetite. Again, appetite relates to the pleasant and the painful, choice neither to the painful nor to the pleasant.

Still less is it anger; for acts due to anger are thought to be less than any others objects of choice.

But neither is it wish, though it seems near to it; for choice cannot relate to impossibles, and if any one said he chose them he would be thought silly; but there may be a wish even for impossibles, e.g. for immortality. And wish may relate to things that could in no way be brought about by one's own efforts, e.g. that a particular actor or athlete should win in a competition; but no one chooses such things, but only the things that he thinks could be brought about by his own efforts. Again, wish relates rather to the end, choice to the means; for instance, we wish to be healthy, but we choose the acts which will make us healthy, and we wish to be happy and say we do, but we cannot well say we choose to be so; for, in general, choice seems to relate to the things that are in our own power.

For this reason, too, it cannot be opinion; for opinion is thought to relate to all kinds of things, no less to eternal things and impossible things than to things in our own power; and it is

distinguished by its falsity or truth, not by its badness or goodness, while choice is distinguished rather by these.

Now with opinion in general perhaps no one even says it is identical. But it is not identical even with any kind of opinion; for by choosing what is good or bad we are men of a certain character, which we are not by holding certain opinions. And we choose to get or avoid something good or bad, but we have opinions about what a thing is or whom it is good for or how it is good for him; we can hardly be said to opine to get or avoid anything. And choice is praised for being related to the right object rather than for being rightly related to it, opinion for being truly related to its object. And we choose what we best know to be good, but we opine what we do not quite know; and it is not the same people that are thought to make the best choices and to have the best opinions, but some are thought to have fairly good opinions, but by reason of vice to choose what they should not. If opinion precedes choice or accompanies it, that makes no difference; for it is not this that we are considering, but whether it is identical with some kind of opinion.

What, then, or what kind of thing is it, since it is none of the things we have mentioned? It seems to be voluntary, but not all that is voluntary to be an object of choice. Is it, then, what has been decided on by previous deliberation? At any rate choice involves a rational principle and thought. Even the name seems to suggest that it is what is chosen before other things.

3

Do we deliberate about everything, and is everything a possible subject of deliberation, or is deliberation impossible about some

things? We ought presumably to call not what a fool or a madman would deliberate about, but what a sensible man would deliberate about, a subject of deliberation. Now about eternal things no one deliberates, e.g. about the material universe or the incommensurability of the diagonal and the side of a square. But no more do we deliberate about the things that involve movement but always happen in the same way, whether of necessity or by nature or from any other cause, e.g. the solstices and the risings of the stars; nor about things that happen now in one way, now in another, e.g. droughts and rains; nor about chance events, like the finding of treasure. But we do not deliberate even about all human affairs; for instance, no Spartan deliberates about the best constitution for the Scythians. For none of these things can be brought about by our own efforts.

We deliberate about things that are in our power and can be done; and these are in fact what is left. For nature, necessity, and chance are thought to be causes, and also reason and everything that depends on man. Now every class of men deliberates about the things that can be done by their own efforts. And in the case of exact and self-contained sciences there is no deliberation, e.g. about the letters of the alphabet (for we have no doubt how they should be written); but the things that are brought about by our own efforts, but not always in the same way, are the things about which we deliberate, e.g. questions of medical treatment or of money-making. And we do so more in the case of the art of navigation than in that of gymnastics, inasmuch as it has been less exactly worked out, and again about other things in the same ratio, and more also in the case of the arts than in that of the sciences; for we have more doubt about the former. Deliberation is concerned with things that happen in a certain way for the most part, but in which the event is obscure, and with things in which it is indeterminate. We call in others to aid us in deliberation on

important questions, distrusting ourselves as not being equal to deciding.

We deliberate not about ends but about means. For a doctor does not deliberate whether he shall heal, nor an orator whether he shall persuade, nor a statesman whether he shall produce law and order, nor does any one else deliberate about his end. They assume the end and consider how and by what means it is to be attained; and if it seems to be produced by several means they consider by which it is most easily and best produced, while if it is achieved by one only they consider how it will be achieved by this and by what means this will be achieved, till they come to the first cause, which in the order of discovery is last. For the person who deliberates seems to investigate and analyse in the way described as though he were analysing a geometrical construction (not all investigation appears to be deliberation – for instance mathematical investigations – but all deliberation is investigation), and what is last in the order of analysis seems to be first in the order of becoming. And if we come on an impossibility, we give up the search, e.g. if we need money and this cannot be got; but if a thing appears possible we try to do it. By 'possible' things I mean things that might be brought about by our own efforts; and these in a sense include things that can be brought about by the efforts of our friends, since the moving principle is in ourselves. The subject of investigation is sometimes the instruments, sometimes the use of them; and similarly in the other cases – sometimes the means, sometimes the mode of using it or the means of bringing it about. It seems, then, as has been said, that man is a moving principle of actions; now deliberation is about the things to be done by the agent himself, and actions are for the sake of things other than themselves. For the end cannot be a subject of deliberation, but only the means; nor indeed can the particular facts be a subject of it, as whether this is bread or has been baked as it should; for these

are matters of perception. If we are to be always deliberating, we shall have to go on to infinity.

The same thing is deliberated upon and is chosen, except that the object of choice is already determinate, since it is that which has been decided upon as a result of deliberation that is the object of choice. For every one ceases to inquire how he is to act when he has brought the moving principle back to himself and to the ruling part of himself; for this is what chooses. This is plain also from the ancient constitutions, which Homer represented; for the kings announced their choices to the people. The object of choice being one of the things in our own power which is desired after deliberation, choice will be deliberate desire of things in our own power; for when we have decided as a result of deliberation, we desire in accordance with our deliberation.

We may take it, then, that we have described choice in outline, and stated the nature of its objects and the fact that it is concerned with means.

4

That wish is for the end has already been stated; some think it is for the good, others for the apparent good. Now those who say that the good is the object of wish must admit in consequence that that which the man who does not choose aright wishes for is not an object of wish (for if it is to be so, it must also be good; but it was, if it so happened, bad); while those who say the apparent good is the object of wish must admit that there is no natural object of wish, but only what seems good to each man. Now different things appear good to different people, and, if it so happens, even contrary things.

If these consequences are unpleasing, are we to say that absolutely and in truth the good is the object of wish, but for each person the apparent good; that that which is in truth an object of wish is an object of wish to the good man, while any chance thing may be so the bad man, as in the case of bodies also the things that are in truth wholesome are wholesome for bodies which are in good condition, while for those that are diseased other things are wholesome – or bitter or sweet or hot or heavy, and so on; since the good man judges each class of things rightly, and in each the truth appears to him? For each state of character has its own ideas of the noble and the pleasant, and perhaps the good man differs from others most by seeing the truth in each class of things, being as it were the norm and measure of them. In most things the error seems to be due to pleasure; for it appears a good when it is not. We therefore choose the pleasant as a good, and avoid pain as an evil.

5

The end, then, being what we wish for, the means what we deliberate about and choose, actions concerning means must be according to choice and voluntary. Now the exercise of the virtues is concerned with means. Therefore virtue also is in our own power, and so too vice. For where it is in our power to act it is also in our power not to act, and vice versa; so that, if to act, where this is noble, is in our power, not to act, which will be base, will also be in our power, and if not to act, where this is noble, is in our power, to act, which will be base, will also be in our power. Now if it is in our power to do noble or base acts, and likewise in our power not to do them, and this was what being

good or bad meant, then it is in our power to be virtuous or vicious.

The saying that 'no one is voluntarily wicked nor involuntarily happy' seems to be partly false and partly true; for no one is involuntarily happy, but wickedness is voluntary. Or else we shall have to dispute what has just been said, at any rate, and deny that man is a moving principle or begetter of his actions as of children. But if these facts are evident and we cannot refer actions to moving principles other than those in ourselves, the acts whose moving principles are in us must themselves also be in our power and voluntary.

Witness seems to be borne to this both by individuals in their private capacity and by legislators themselves; for these punish and take vengeance on those who do wicked acts (unless they have acted under compulsion or as a result of ignorance for which they are not themselves responsible), while they honour those who do noble acts, as though they meant to encourage the latter and deter the former. But no one is encouraged to do the things that are neither in our power nor voluntary; it is assumed that there is no gain in being persuaded not to be hot or in pain or hungry or the like, since we shall experience these feelings none the less. Indeed, we punish a man for his very ignorance, if he is thought responsible for the ignorance, as when penalties are doubled in the case of drunkenness; for the moving principle is in the man himself, since he had the power of not getting drunk and his getting drunk was the cause of his ignorance. And we punish those who are ignorant of anything in the laws that they ought to know and that is not difficult, and so too in the case of anything else that they are thought to be ignorant of through carelessness; we assume that it is in their power not to be ignorant, since they have the power of taking care.

But perhaps a man is the kind of man not to take care. Still they are themselves by their slack lives responsible for becoming men of that kind, and men make themselves responsible for being unjust or self-indulgent, in the one case by cheating and in the other by spending their time in drinking bouts and the like; for it is activities exercised on particular objects that make the corresponding character. This is plain from the case of people training for any contest or action; they practise the activity the whole time. Now not to know that it is from the exercise of activities on particular objects that states of character are produced is the mark of a thoroughly senseless person. Again, it is irrational to suppose that a man who acts unjustly does not wish to be unjust or a man who acts self-indulgently to be self-indulgent. But if without being ignorant a man does the things which will make him unjust, he will be unjust voluntarily. Yet it does not follow that if he wishes he will cease to be unjust and will be just. For neither does the man who is ill become well on those terms. We may suppose a case in which he is ill voluntarily, through living incontinently and disobeying his doctors. In that case it was then open to him not to be ill, but not now, when he has thrown away his chance, just as when you have let a stone go it is too late to recover it; but yet it was in your power to throw it, since the moving principle was in you. So, too, to the unjust and to the self-indulgent man it was open at the beginning not to become men of this kind, and so they are unjust and selfindulgent voluntarily; but now that they have become so it is not possible for them not to be so.

But not only are the vices of the soul voluntary, but those of the body also for some men, whom we accordingly blame; while no one blames those who are ugly by nature, we blame those who are so owing to want of exercise and care. So it is, too, with respect to weakness and infirmity; no one would reproach a man blind from birth or by disease or from a blow, but rather

pity him, while every one would blame a man who was blind from drunkenness or some other form of self-indulgence. Of vices of the body, then, those in our own power are blamed, those not in our power are not. And if this be so, in the other cases also the vices that are blamed must be in our own power.

Now some one may say that all men desire the apparent good, but have no control over the appearance, but the end appears to each man in a form answering to his character. We reply that if each man is somehow responsible for his state of mind, he will also be himself somehow responsible for the appearance; but if not, no one is responsible for his own evildoing, but every one does evil acts through ignorance of the end, thinking that by these he will get what is best, and the aiming at the end is not self-chosen but one must be born with an eye, as it were, by which to judge rightly and choose what is truly good, and he is well endowed by nature who is well endowed with this. For it is what is greatest and most noble, and what we cannot get or learn from another, but must have just such as it was when given us at birth, and to be well and nobly endowed with this will be perfect and true excellence of natural endowment. If this is true, then, how will virtue be more voluntary than vice? To both men alike, the good and the bad, the end appears and is fixed by nature or however it may be, and it is by referring everything else to this that men do whatever they do.

Whether, then, it is not by nature that the end appears to each man such as it does appear, but something also depends on him, or the end is natural but because the good man adopts the means voluntarily virtue is voluntary, vice also will be none the less voluntary; for in the case of the bad man there is equally present that which depends on himself in his actions even if not in his end. If, then, as is asserted, the virtues are voluntary (for we are ourselves somehow partly responsible for our states of character, and it is by being persons of a certain kind that we

assume the end to be so and so), the vices also will be voluntary; for the same is true of them.

With regard to the virtues in general we have stated their genus in outline, viz. that they are means and that they are states of character, and that they tend, and by their own nature, to the doing of the acts by which they are produced, and that they are in our power and voluntary, and act as the right rule prescribes. But actions and states of character are not voluntary in the same way; for we are masters of our actions from the beginning right to the end, if we know the particular facts, but though we control the beginning of our states of character the gradual progress is not obvious any more than it is in illnesses; because it was in our power, however, to act in this way or not in this way, therefore the states are voluntary.

Let us take up the several virtues, however, and say which they are and what sort of things they are concerned with and how they are concerned with them; at the same time it will become plain how many they are. And first let us speak of courage.

6

That it is a mean with regard to feelings of fear and confidence has already been made evident; and plainly the things we fear are terrible things, and these are, to speak without qualification, evils; for which reason people even define fear as expectation of evil. Now we fear all evils, e.g. disgrace, poverty, disease, friendlessness, death, but the brave man is not thought to be concerned with all; for to fear some things is even right and noble, and it is base not to fear them – e.g. disgrace; he who fears this is good and modest, and he who does not is shameless. He is, however, by some people called brave, by a

transference of the word to a new meaning; for he has in him something which is like the brave man, since the brave man also is a fearless person. Poverty and disease we perhaps ought not to fear, nor in general the things that do not proceed from vice and are not due to a man himself. But not even the man who is fearless of these is brave. Yet we apply the word to him also in virtue of a similarity; for some who in the dangers of war are cowards are liberal and are confident in face of the loss of money. Nor is a man a coward if he fears insult to his wife and children or envy or anything of the kind; nor brave if he is confident when he is about to be flogged. With what sort of terrible things, then, is the brave man concerned? Surely with the greatest; for no one is more likely than he to stand his ground against what is awe-inspiring. Now death is the most terrible of all things; for it is the end, and nothing is thought to be any longer either good or bad for the dead. But the brave man would not seem to be concerned even with death in all circumstances, e.g. at sea or in disease. In what circumstances, then? Surely in the noblest. Now such deaths are those in battle; for these take place in the greatest and noblest danger. And these are correspondingly honoured in city-states and at the courts of monarchs. Properly, then, he will be called brave who is fearless in face of a noble death, and of all emergencies that involve death; and the emergencies of war are in the highest degree of this kind. Yet at sea also, and in disease, the brave man is fearless, but not in the same way as the seaman; for he has given up hope of safety, and is disliking the thought of death in this shape, while they are hopeful because of their experience. At the same time, we show courage in situations where there is the opportunity of showing prowess or where death is noble; but in these forms of death neither of these conditions is fulfilled.

7

What is terrible is not the same for all men; but we say there are things terrible even beyond human strength. These, then, are terrible to every one – at least to every sensible man; but the terrible things that are not beyond human strength differ in magnitude and degree, and so too do the things that inspire confidence. Now the brave man is as dauntless as man may be. Therefore, while he will fear even the things that are not beyond human strength, he will face them as he ought and as the rule directs, for honour's sake; for this is the end of virtue. But it is possible to fear these more, or less, and again to fear things that are not terrible as if they were. Of the faults that are committed one consists in fearing what one should not, another in fearing as we should not, another in fearing when we should not, and so on; and so too with respect to the things that inspire confidence. The man, then, who faces and who fears the right things and from the right motive, in the right way and from the right time, and who feels confidence under the corresponding conditions, is brave; for the brave man feels and acts according to the merits of the case and in whatever way the rule directs. Now the end of every activity is conformity to the corresponding state of character. This is true, therefore, of the brave man as well as of others. But courage is noble. Therefore the end also is noble; for each thing is defined by its end. Therefore it is for a noble end that the brave man endures and acts as courage directs.

Of those who go to excess he who exceeds in fearlessness has no name (we have said previously that many states of character have no names), but he would be a sort of madman or insensible person if he feared nothing, neither earthquakes nor the waves, as they say the Celts do not; while the man who

exceeds in confidence about what really is terrible is rash. The rash man, however, is also thought to be boastful and only a pretender to courage; at all events, as the brave man is with regard to what is terrible, so the rash man wishes to appear; and so he imitates him in situations where he can. Hence also most of them are a mixture of rashness and cowardice; for, while in these situations they display confidence, they do not hold their ground against what is really terrible. The man who exceeds in fear is a coward; for he fears both what he ought not and as he ought not, and all the similar characterizations attach to him. He is lacking also in confidence; but he is more conspicuous for his excess of fear in painful situations. The coward, then, is a despairing sort of person; for he fears everything. The brave man, on the other hand, has the opposite disposition; for confidence is the mark of a hopeful disposition. The coward, the rash man, and the brave man, then, are concerned with the same objects but are differently disposed towards them; for the first two exceed and fall short, while the third holds the middle, which is the right, position; and rash men are precipitate, and wish for dangers beforehand but draw back when they are in them, while brave men are keen in the moment of action, but quiet beforehand.

As we have said, then, courage is a mean with respect to things that inspire confidence or fear, in the circumstances that have been stated; and it chooses or endures things because it is noble to do so, or because it is base not to do so. But to die to escape from poverty or love or anything painful is not the mark of a brave man, but rather of a coward; for it is softness to fly from what is troublesome, and such a man endures death not because it is noble but to fly from evil.

8

Courage, then, is something of this sort, but the name is also applied to five other kinds.

First comes the courage of the citizen-soldier; for this is most like true courage. Citizen-soldiers seem to face dangers because of the penalties imposed by the laws and the reproaches they would otherwise incur, and because of the honours they win by such action; and therefore those peoples seem to be bravest among whom cowards are held in dishonour and brave men in honour. This is the kind of courage that Homer depicts, e.g. in Diomede and in Hector:

First will Polydamas be to heap reproach on me then; and

For Hector one day 'mid the Trojans shall utter his vaulting harangue:

Afraid was Tydeides, and fled from my face.

This kind of courage is most like to that which we described earlier, because it is due to virtue; for it is due to shame and to desire of a noble object (i.e. honour) and avoidance of disgrace, which is ignoble. One might rank in the same class even those who are compelled by their rulers; but they are inferior, inasmuch as they do what they do not from shame but from fear, and to avoid not what is disgraceful but what is painful; for their masters compel them, as Hector does:

But if I shall spy any dastard that cowers far from the fight,

Vainly will such an one hope to escape from the dogs.

And those who give them their posts, and beat them if they retreat, do the same, and so do those who draw them up with trenches or something of the sort behind them; all of these

apply compulsion. But one ought to be brave not under compulsion but because it is noble to be so.

(2) Experience with regard to particular facts is also thought to be courage; this is indeed the reason why Socrates thought courage was knowledge. Other people exhibit this quality in other dangers, and professional soldiers exhibit it in the dangers of war; for there seem to be many empty alarms in war, of which these have had the most comprehensive experience; therefore they seem brave, because the others do not know the nature of the facts. Again, their experience makes them most capable in attack and in defence, since they can use their arms and have the kind that are likely to be best both for attack and for defence; therefore they fight like armed men against unarmed or like trained athletes against amateurs; for in such contests too it is not the bravest men that fight best, but those who are strongest and have their bodies in the best condition. Professional soldiers turn cowards, however, when the danger puts too great a strain on them and they are inferior in numbers and equipment; for they are the first to fly, while citizen-forces die at their posts, as in fact happened at the temple of Hermes. For to the latter flight is disgraceful and death is preferable to safety on those terms; while the former from the very beginning faced the danger on the assumption that they were stronger, and when they know the facts they fly, fearing death more than disgrace; but the brave man is not that sort of person.

(3) Passion also is sometimes reckoned as courage; those who act from passion, like wild beasts rushing at those who have wounded them, are thought to be brave, because brave men also are passionate; for passion above all things is eager to rush on danger, and hence Homer's 'put strength into his passion' and 'aroused their spirit and passion and 'hard he breathed panting' and 'his blood boiled'. For all such expressions seem to indicate the stirring and onset of passion. Now brave men act for

honour's sake, but passion aids them; while wild beasts act under the influence of pain; for they attack because they have been wounded or because they are afraid, since if they are in a forest they do not come near one. Thus they are not brave because, driven by pain and passion, they rush on danger without foreseeing any of the perils, since at that rate even asses would be brave when they are hungry; for blows will not drive them from their food; and lust also makes adulterers do many daring things. (Those creatures are not brave, then, which are driven on to danger by pain or passion.) The 'courage' that is due to passion seems to be the most natural, and to be courage if choice and motive be added.

Men, then, as well as beasts, suffer pain when they are angry, and are pleased when they exact their revenge; those who fight for these reasons, however, are pugnacious but not brave; for they do not act for honour's sake nor as the rule directs, but from strength of feeling; they have, however, something akin to courage.

(4) Nor are sanguine people brave; for they are confident in danger only because they have conquered often and against many foes. Yet they closely resemble brave men, because both are confident; but brave men are confident for the reasons stated earlier, while these are so because they think they are the strongest and can suffer nothing. (Drunken men also behave in this way; they become sanguine). When their adventures do not succeed, however, they run away; but it was the mark of a brave man to face things that are, and seem, terrible for a man, because it is noble to do so and disgraceful not to do so. Hence also it is thought the mark of a braver man to be fearless and undisturbed in sudden alarms than to be so in those that are foreseen; for it must have proceeded more from a state of character, because less from preparation; acts that are foreseen

may be chosen by calculation and rule, but sudden actions must be in accordance with one's state of character.

(5) People who are ignorant of the danger also appear brave, and they are not far removed from those of a sanguine temper, but are inferior inasmuch as they have no self-reliance while these have. Hence also the sanguine hold their ground for a time; but those who have been deceived about the facts fly if they know or suspect that these are different from what they supposed, as happened to the Argives when they fell in with the Spartans and took them for Sicyonians.

We have, then, described the character both of brave men and of those who are thought to be brave.

9

Though courage is concerned with feelings of confidence and of fear, it is not concerned with both alike, but more with the things that inspire fear; for he who is undisturbed in face of these and bears himself as he should towards these is more truly brave than the man who does so towards the things that inspire confidence. It is for facing what is painful, then, as has been said, that men are called brave. Hence also courage involves pain, and is justly praised; for it is harder to face what is painful than to abstain from what is pleasant.

Yet the end which courage sets before it would seem to be pleasant, but to be concealed by the attending circumstances, as happens also in athletic contests; for the end at which boxers aim is pleasant – the crown and the honours – but the blows they take are distressing to flesh and blood, and painful, and so is their whole exertion; and because the blows and the

exertions are many the end, which is but small, appears to have nothing pleasant in it. And so, if the case of courage is similar, death and wounds will be painful to the brave man and against his will, but he will face them because it is noble to do so or because it is base not to do so. And the more he is possessed of virtue in its entirety and the happier he is, the more he will be pained at the thought of death; for life is best worth living for such a man, and he is knowingly losing the greatest goods, and this is painful. But he is none the less brave, and perhaps all the more so, because he chooses noble deeds of war at that cost. It is not the case, then, with all the virtues that the exercise of them is pleasant, except in so far as it reaches its end. But it is quite possible that the best soldiers may be not men of this sort but those who are less brave but have no other good; for these are ready to face danger, and they sell their life for trifling gains.

So much, then, for courage; it is not difficult to grasp its nature in outline, at any rate, from what has been said.

10

After courage let us speak of temperance; for these seem to be the virtues of the irrational parts. We have said that temperance is a mean with regard to pleasures (for it is less, and not in the same way, concerned with pains); self-indulgence also is manifested in the same sphere. Now, therefore, let us determine with what sort of pleasures they are concerned. We may assume the distinction between bodily pleasures and those of the soul, such as love of honour and love of learning; for the lover of each of these delights in that of which he is a lover, the body being in no way affected, but rather the mind; but men who are concerned with such pleasures are called neither temperate nor

self-indulgent. Nor, again, are those who are concerned with the other pleasures that are not bodily; for those who are fond of hearing and telling stories and who spend their days on anything that turns up are called gossips, but not self-indulgent, nor are those who are pained at the loss of money or of friends.

Temperance must be concerned with bodily pleasures, but not all even of these; for those who delight in objects of vision, such as colours and shapes and painting, are called neither temperate nor self-indulgent; yet it would seem possible to delight even in these either as one should or to excess or to a deficient degree.

And so too is it with objects of hearing; no one calls those who delight extravagantly in music or acting self-indulgent, nor those who do so as they ought temperate.

Nor do we apply these names to those who delight in odour, unless it be incidentally; we do not call those self-indulgent who delight in the odour of apples or roses or incense, but rather those who delight in the odour of unguents or of dainty dishes; for self-indulgent people delight in these because these remind them of the objects of their appetite. And one may see even other people, when they are hungry, delighting in the smell of food; but to delight in this kind of thing is the mark of the self-indulgent man; for these are objects of appetite to him.

Nor is there in animals other than man any pleasure connected with these senses, except incidentally. For dogs do not delight in the scent of hares, but in the eating of them, but the scent told them the hares were there; nor does the lion delight in the lowing of the ox, but in eating it; but he perceived by the lowing that it was near, and therefore appears to delight in the lowing; and similarly he does not delight because he sees 'a stag or a wild goat', but because he is going to make a meal of it. Temperance and self-indulgence, however, are concerned with

the kind of pleasures that the other animals share in, which therefore appear slavish and brutish; these are touch and taste. But even of taste they appear to make little or no use; for the business of taste is the discriminating of flavours, which is done by winetasters and people who season dishes; but they hardly take pleasure in making these discriminations, or at least self-indulgent people do not, but in the actual enjoyment, which in all cases comes through touch, both in the case of food and in that of drink and in that of sexual intercourse. This is why a certain gourmand prayed that his throat might become longer than a crane's, implying that it was the contact that he took pleasure in. Thus the sense with which self-indulgence is connected is the most widely shared of the senses; and self-indulgence would seem to be justly a matter of reproach, because it attaches to us not as men but as animals. To delight in such things, then, and to love them above all others, is brutish. For even of the pleasures of touch the most liberal have been eliminated, e.g. those produced in the gymnasium by rubbing and by the consequent heat; for the contact characteristic of the self-indulgent man does not affect the whole body but only certain parts.

11

Of the appetites some seem to be common, others to be peculiar to individuals and acquired; e.g. the appetite for food is natural, since every one who is without it craves for food or drink, and sometimes for both, and for love also (as Homer says) if he is young and lusty; but not every one craves for this or that kind of nourishment or love, nor for the same things. Hence such craving appears to be our very own. Yet it has of course something natural about it; for different things are pleasant to

different kinds of people, and some things are more pleasant to every one than chance objects. Now in the natural appetites few go wrong, and only in one direction, that of excess; for to eat or drink whatever offers itself till one is surfeited is to exceed the natural amount, since natural appetite is the replenishment of one's deficiency. Hence these people are called belly-gods, this implying that they fill their belly beyond what is right. It is people of entirely slavish character that become like this. But with regard to the pleasures peculiar to individuals many people go wrong and in many ways. For while the people who are 'fond of so and so' are so called because they delight either in the wrong things, or more than most people do, or in the wrong way, the self-indulgent exceed in all three ways; they both delight in some things that they ought not to delight in (since they are hateful), and if one ought to delight in some of the things they delight in, they do so more than one ought and than most men do.

Plainly, then, excess with regard to pleasures is self-indulgence and is culpable; with regard to pains one is not, as in the case of courage, called temperate for facing them or self-indulgent for not doing so, but the selfindulgent man is so called because he is pained more than he ought at not getting pleasant things (even his pain being caused by pleasure), and the temperate man is so called because he is not pained at the absence of what is pleasant and at his abstinence from it.

The self-indulgent man, then, craves for all pleasant things or those that are most pleasant, and is led by his appetite to choose these at the cost of everything else; hence he is pained both when he fails to get them and when he is merely craving for them (for appetite involves pain); but it seems absurd to be pained for the sake of pleasure. People who fall short with regard to pleasures and delight in them less than they should are hardly found; for such insensibility is not human. Even the

other animals distinguish different kinds of food and enjoy some and not others; and if there is any one who finds nothing pleasant and nothing more attractive than anything else, he must be something quite different from a man; this sort of person has not received a name because he hardly occurs. The temperate man occupies a middle position with regard to these objects. For he neither enjoys the things that the self-indulgent man enjoys most – but rather dislikes them – nor in general the things that he should not, nor anything of this sort to excess, nor does he feel pain or craving when they are absent, or does so only to a moderate degree, and not more than he should, nor when he should not, and so on; but the things that, being pleasant, make for health or for good condition, he will desire moderately and as he should, and also other pleasant things if they are not hindrances to these ends, or contrary to what is noble, or beyond his means. For he who neglects these conditions loves such pleasures more than they are worth, but the temperate man is not that sort of person, but the sort of person that the right rule prescribes.

12

Self-indulgence is more like a voluntary state than cowardice. For the former is actuated by pleasure, the latter by pain, of which the one is to be chosen and the other to be avoided; and pain upsets and destroys the nature of the person who feels it, while pleasure does nothing of the sort. Therefore self-indulgence is more voluntary. Hence also it is more a matter of reproach; for it is easier to become accustomed to its objects, since there are many things of this sort in life, and the process of habituation to them is free from danger, while with terrible objects the reverse is the case. But cowardice would seem to be

voluntary in a different degree from its particular manifestations; for it is itself painless, but in these we are upset by pain, so that we even throw down our arms and disgrace ourselves in other ways; hence our acts are even thought to be done under compulsion. For the self-indulgent man, on the other hand, the particular acts are voluntary (for he does them with craving and desire), but the whole state is less so; for no one craves to be self-indulgent.

The name self-indulgence is applied also to childish faults; for they bear a certain resemblance to what we have been considering. Which is called after which, makes no difference to our present purpose; plainly, however, the later is called after the earlier. The transference of the name seems not a bad one; for that which desires what is base and which develops quickly ought to be kept in a chastened condition, and these characteristics belong above all to appetite and to the child, since children in fact live at the beck and call of appetite, and it is in them that the desire for what is pleasant is strongest. If, then, it is not going to be obedient and subject to the ruling principle, it will go to great lengths; for in an irrational being the desire for pleasure is insatiable even if it tries every source of gratification, and the exercise of appetite increases its innate force, and if appetites are strong and violent they even expel the power of calculation. Hence they should be moderate and few, and should in no way oppose the rational principle – and this is what we call an obedient and chastened state – and as the child should live according to the direction of his tutor, so the appetitive element should live according to rational principle. Hence the appetitive element in a temperate man should harmonize with the rational principle; for the noble is the mark at which both aim, and the temperate man craves for the things be ought, as he ought, as when he ought; and when he ought; and this is what rational principle directs.

Here we conclude our account of temperance.

Book IV

1

Let us speak next of liberality. It seems to be the mean with regard to wealth; for the liberal man is praised not in respect of military matters, nor of those in respect of which the temrate man is praised, nor of judicial decisions, but with regard to the giving and taking of wealth, and especially in respect of giving. Now by 'wealth' we mean all the things whose value is measured by money. Further, prodigality and meanness are excesses and defects with regard to wealth; and meanness we always impute to those who care more than they ought for wealth, but we sometimes apply the word 'prodigality' in a complex sense; for we call those men prodigals who are incontinent and spend money on self-indulgence. Hence also they are thought the poorest characters; for they combine more vices than one. Therefore the application of the word to them is not its proper use; for a 'prodigal' means a man who has a single evil quality, that of wasting his substance; since a prodigal is one who is being ruined by his own fault, and the wasting of substance is thought to be a sort of ruining of oneself, life being held to depend on possession of substance.

This, then, is the sense in which we take the word 'prodigality'. Now the things that have a use may be used either well or

badly; and riches is a useful thing; and everything is used best by the man who has the virtue concerned with it; riches, therefore, will be used best by the man who has the virtue concerned with wealth; and this is the liberal man. Now spending and giving seem to be the using of wealth; taking and keeping rather the possession of it. Hence it is more the mark of the liberal man to give to the right people than to take from the right sources and not to take from the wrong. For it is more characteristic of virtue to do good than to have good done to one, and more characteristic to do what is noble than not to do what is base; and it is not hard to see that giving implies doing good and doing what is noble, and taking implies having good done to one or not acting basely. And gratitude is felt towards him who gives, not towards him who does not take, and praise also is bestowed more on him. It is easier, also, not to take than to give; for men are apter to give away their own too little than to take what is another's. Givers, too, are called liberal; but those who do not take are not praised for liberality but rather for justice; while those who take are hardly praised at all. And the liberal are almost the most loved of all virtuous characters, since they are useful; and this depends on their giving.

Now virtuous actions are noble and done for the sake of the noble. Therefore the liberal man, like other virtuous men, will give for the sake of the noble, and rightly; for he will give to the right people, the right amounts, and at the right time, with all the other qualifications that accompany right giving; and that too with pleasure or without pain; for that which is virtuous is pleasant or free from pain – least of all will it be painful. But he who gives to the wrong people or not for the sake of the noble but for some other cause, will be called not liberal but by some other name. Nor is he liberal who gives with pain; for he would prefer the wealth to the noble act, and this is not characteristic of a liberal man. But no more will the liberal man take from wrong sources; for such taking is not characteristic of the man

who sets no store by wealth. Nor will he be a ready asker; for it is not characteristic of a man who confers benefits to accept them lightly. But he will take from the right sources, e.g. from his own possessions, not as something noble but as a necessity, that he may have something to give. Nor will he neglect his own property, since he wishes by means of this to help others. And he will refrain from giving to anybody and everybody, that he may have something to give to the right people, at the right time, and where it is noble to do so. It is highly characteristic of a liberal man also to go to excess in giving, so that he leaves too little for himself; for it is the nature of a liberal man not to look to himself. The term 'liberality' is used relatively to a man's substance; for liberality resides not in the multitude of the gifts but in the state of character of the giver, and this is relative to the giver's substance. There is therefore nothing to prevent the man who gives less from being the more liberal man, if he has less to give those are thought to be more liberal who have not made their wealth but inherited it; for in the first place they have no experience of want, and secondly all men are fonder of their own productions, as are parents and poets. It is not easy for the liberal man to be rich, since he is not apt either at taking or at keeping, but at giving away, and does not value wealth for its own sake but as a means to giving. Hence comes the charge that is brought against fortune, that those who deserve riches most get it least. But it is not unreasonable that it should turn out so; for he cannot have wealth, any more than anything else, if he does not take pains to have it. Yet he will not give to the wrong people nor at the wrong time, and so on; for he would no longer be acting in accordance with liberality, and if he spent on these objects he would have nothing to spend on the right objects. For, as has been said, he is liberal who spends according to his substance and on the right objects; and he who exceeds is prodigal. Hence we do not call despots prodigal; for it is thought not easy for them to give and spend beyond the amount of their

possessions. Liberality, then, being a mean with regard to giving and taking of wealth, the liberal man will both give and spend the right amounts and on the right objects, alike in small things and in great, and that with pleasure; he will also take the right amounts and from the right sources. For, the virtue being a mean with regard to both, he will do both as he ought; since this sort of taking accompanies proper giving, and that which is not of this sort is contrary to it, and accordingly the giving and taking that accompany each other are present together in the same man, while the contrary kinds evidently are not. But if he happens to spend in a manner contrary to what is right and noble, he will be pained, but moderately and as he ought; for it is the mark of virtue both to be pleased and to be pained at the right objects and in the right way. Further, the liberal man is easy to deal with in money matters; for he can be got the better of, since he sets no store by money, and is more annoyed if he has not spent something that he ought than pained if he has spent something that he ought not, and does not agree with the saying of Simonides.

The prodigal errs in these respects also; for he is neither pleased nor pained at the right things or in the right way; this will be more evident as we go on. We have said that prodigality and meanness are excesses and deficiencies, and in two things, in giving and in taking; for we include spending under giving. Now prodigality exceeds in giving and not taking, while meanness falls short in giving, and exceeds in taking, except in small things.

The characteristics of prodigality are not often combined; for it is not easy to give to all if you take from none; private persons soon exhaust their substance with giving, and it is to these that the name of prodigals is applied – though a man of this sort would seem to be in no small degree better than a mean man. For he is easily cured both by age and by poverty, and thus he

may move towards the middle state. For he has the characteristics of the liberal man, since he both gives and refrains from taking, though he does neither of these in the right manner or well. Therefore if he were brought to do so by habituation or in some other way, he would be liberal; for he will then give to the right people, and will not take from the wrong sources. This is why he is thought to have not a bad character; it is not the mark of a wicked or ignoble man to go to excess in giving and not taking, but only of a foolish one. The man who is prodigal in this way is thought much better than the mean man both for the aforesaid reasons and because he benefits many while the other benefits no one, not even himself.

But most prodigal people, as has been said, also take from the wrong sources, and are in this respect mean. They become apt to take because they wish to spend and cannot do this easily; for their possessions soon run short. Thus they are forced to provide means from some other source. At the same time, because they care nothing for honour, they take recklessly and from any source; for they have an appetite for giving, and they do not mind how or from what source. Hence also their giving is not liberal; for it is not noble, nor does it aim at nobility, nor is it done in the right way; sometimes they make rich those who should be poor, and will give nothing to people of respectable character, and much to flatterers or those who provide them with some other pleasure. Hence also most of them are self-indulgent; for they spend lightly and waste money on their indulgences, and incline towards pleasures because they do not live with a view to what is noble.

The prodigal man, then, turns into what we have described if he is left untutored, but if he is treated with care he will arrive at the intermediate and right state. But meanness is both incurable (for old age and every disability is thought to make

men mean) and more innate in men than prodigality; for most men are fonder of getting money than of giving. It also extends widely, and is multiform, since there seem to be many kinds of meanness.

For it consists in two things, deficiency in giving and excess in taking, and is not found complete in all men but is sometimes divided; some men go to excess in taking, others fall short in giving. Those who are called by such names as 'miserly', 'close', 'stingy', all fall short in giving, but do not covet the possessions of others nor wish to get them. In some this is due to a sort of honesty and avoidance of what is disgraceful (for some seem, or at least profess, to hoard their money for this reason, that they may not some day be forced to do something disgraceful; to this class belong the cheeseparer and every one of the sort; he is so called from his excess of unwillingness to give anything); while others again keep their hands off the property of others from fear, on the ground that it is not easy, if one takes the property of others oneself, to avoid having one's own taken by them; they are therefore content neither to take nor to give.

Others again exceed in respect of taking by taking anything and from any source, e.g. those who ply sordid trades, pimps and all such people, and those who lend small sums and at high rates. For all of these take more than they ought and from wrong sources. What is common to them is evidently sordid love of gain; they all put up with a bad name for the sake of gain, and little gain at that. For those who make great gains but from wrong sources, and not the right gains, e.g. despots when they sack cities and spoil temples, we do not call mean but rather wicked, impious, and unjust. But the gamester and the footpad (and the highwayman) belong to the class of the mean, since they have a sordid love of gain. For it is for gain that both of them ply their craft and endure the disgrace of it, and the one faces the greatest dangers for the sake of the booty, while the

other makes gain from his friends, to whom he ought to be giving. Both, then, since they are willing to make gain from wrong sources, are sordid lovers of gain; therefore all such forms of taking are mean.

And it is natural that meanness is described as the contrary of liberality; for not only is it a greater evil than prodigality, but men err more often in this direction than in the way of prodigality as we have described it.

So much, then, for liberality and the opposed vices.

2

It would seem proper to discuss magnificence next. For this also seems to be a virtue concerned with wealth; but it does not like liberality extend to all the actions that are concerned with wealth, but only to those that involve expenditure; and in these it surpasses liberality in scale. For, as the name itself suggests, it is a fitting expenditure involving largeness of scale. But the scale is relative; for the expense of equipping a trireme is not the same as that of heading a sacred embassy. It is what is fitting, then, in relation to the agent, and to the circumstances and the object. The man who in small or middling things spends according to the merits of the case is not called magnificent (e.g. the man who can say 'many a gift I gave the wanderer'), but only the man who does so in great things. For the magnificent man is liberal, but the liberal man is not necessarily magnificent. The deficiency of this state of character is called niggardliness, the excess vulgarity, lack of taste, and the like, which do not go to excess in the amount spent on right objects, but by showy expenditure in the wrong circumstances and the wrong manner; we shall speak of these vices later.

The magnificent man is like an artist; for he can see what is fitting and spend large sums tastefully. For, as we said at the begining, a state of character is determined by its activities and by its objects. Now the expenses of the magnificent man are large and fitting. Such, therefore, are also his results; for thus there will be a great expenditure and one that is fitting to its result. Therefore the result should be worthy of the expense, and the expense should be worthy of the result, or should even exceed it. And the magnificent man will spend such sums for honour's sake; for this is common to the virtues. And further he will do so gladly and lavishly; for nice calculation is a niggardly thing. And he will consider how the result can be made most beautiful and most becoming rather than for how much it can be produced and how it can be produced most cheaply. It is necessary, then, that the magnificent man be also liberal. For the liberal man also will spend what he ought and as he ought; and it is in these matters that the greatness implied in the name of the magnificent man – his bigness, as it were – is manifested, since liberality is concerned with these matters; and at an equal expense he will produce a more magnificent work of art. For a possession and a work of art have not the same excellence. The most valuable possession is that which is worth most, e.g. gold, but the most valuable work of art is that which is great and beautiful (for the contemplation of such a work inspires admiration, and so does magnificence); and a work has an excellence – viz. magnificence – which involves magnitude. Magnificence is an attribute of expenditures of the kind which we call honourable, e.g. those connected with the gods – votive offerings, buildings, and sacrifices – and similarly with any form of religious worship, and all those that are proper objects of public-spirited ambition, as when people think they ought to equip a chorus or a trireme, or entertain the city, in a brilliant way. But in all cases, as has been said, we have regard to the agent as well and ask who he is and what means he has;

for the expenditure should be worthy of his means, and suit not only the result but also the producer. Hence a poor man cannot be magnificent, since he has not the means with which to spend large sums fittingly; and he who tries is a fool, since he spends beyond what can be expected of him and what is proper, but it is right expenditure that is virtuous. But great expenditure is becoming to those who have suitable means to start with, acquired by their own efforts or from ancestors or connexions, and to people of high birth or reputation, and so on; for all these things bring with them greatness and prestige. Primarily, then, the magnificent man is of this sort, and magnificence is shown in expenditures of this sort, as has been said; for these are the greatest and most honourable. Of private occasions of expenditure the most suitable are those that take place once for all, e.g. a wedding or anything of the kind, or anything that interests the whole city or the people of position in it, and also the receiving of foreign guests and the sending of them on their way, and gifts and counter-gifts; for the magnificent man spends not on himself but on public objects, and gifts bear some resemblance to votive offerings. A magnificent man will also furnish his house suitably to his wealth (for even a house is a sort of public ornament), and will spend by preference on those works that are lasting (for these are the most beautiful), and on every class of things he will spend what is becoming; for the same things are not suitable for gods and for men, nor in a temple and in a tomb. And since each expenditure may be great of its kind, and what is most magnificent absolutely is great expenditure on a great object, but what is magnificent here is what is great in these circumstances, and greatness in the work differs from greatness in the expense (for the most beautiful ball or bottle is magnificent as a gift to a child, but the price of it is small and mean), – therefore it is characteristic of the magnificent man, whatever kind of result he is producing, to

produce it magnificently (for such a result is not easily surpassed) and to make it worthy of the expenditure.

Such, then, is the magnificent man; the man who goes to excess and is vulgar exceeds, as has been said, by spending beyond what is right. For on small objects of expenditure he spends much and displays a tasteless showiness; e.g. he gives a club dinner on the scale of a wedding banquet, and when he provides the chorus for a comedy he brings them on to the stage in purple, as they do at Megara. And all such things he will do not for honour's sake but to show off his wealth, and because he thinks he is admired for these things, and where he ought to spend much he spends little and where little, much. The niggardly man on the other hand will fall short in everything, and after spending the greatest sums will spoil the beauty of the result for a trifle, and whatever he is doing he will hesitate and consider how he may spend least, and lament even that, and think he is doing everything on a bigger scale than he ought.

These states of character, then, are vices; yet they do not bring disgrace because they are neither harmful to one's neighbour nor very unseemly.

3

Pride seems even from its name to be concerned with great things; what sort of great things, is the first question we must try to answer. It makes no difference whether we consider the state of character or the man characterized by it. Now the man is thought to be proud who thinks himself worthy of great things, being worthy of them; for he who does so beyond his deserts is a fool, but no virtuous man is foolish or silly. The

proud man, then, is the man we have described. For he who is worthy of little and thinks himself worthy of little is temperate, but not proud; for pride implies greatness, as beauty implies a goodsized body, and little people may be neat and well-proportioned but cannot be beautiful. On the other hand, he who thinks himself worthy of great things, being unworthy of them, is vain; though not every one who thinks himself worthy of more than he really is worthy of in vain. The man who thinks himself worthy of worthy of less than he is really worthy of is unduly humble, whether his deserts be great or moderate, or his deserts be small but his claims yet smaller. And the man whose deserts are great would seem most unduly humble; for what would he have done if they had been less? The proud man, then, is an extreme in respect of the greatness of his claims, but a mean in respect of the rightness of them; for he claims what is accordance with his merits, while the others go to excess or fall short.

If, then, he deserves and claims great things, and above all the great things, he will be concerned with one thing in particular. Desert is relative to external goods; and the greatest of these, we should say, is that which we render to the gods, and which people of position most aim at, and which is the prize appointed for the noblest deeds; and this is honour; that is surely the greatest of external goods. Honours and dishonours, therefore, are the objects with respect to which the proud man is as he should be. And even apart from argument it is with honour that proud men appear to be concerned; for it is honour that they chiefly claim, but in accordance with their deserts. The unduly humble man falls short both in comparison with his own merits and in comparison with the proud man's claims. The vain man goes to excess in comparison with his own merits, but does not exceed the proud man's claims.

Now the proud man, since he deserves most, must be good in the highest degree; for the better man always deserves more, and the best man most. Therefore the truly proud man must be good. And greatness in every virtue would seem to be characteristic of a proud man. And it would be most unbecoming for a proud man to fly from danger, swinging his arms by his sides, or to wrong another; for to what end should he do disgraceful acts, he to whom nothing is great? If we consider him point by point we shall see the utter absurdity of a proud man who is not good. Nor, again, would he be worthy of honour if he were bad; for honour is the prize of virtue, and it is to the good that it is rendered. Pride, then, seems to be a sort of crown of the virtues; for it makes them greater, and it is not found without them. Therefore it is hard to be truly proud; for it is impossible without nobility and goodness of character. It is chiefly with honours and dishonours, then, that the proud man is concerned; and at honours that are great and conferred by good men he will be moderately Pleased, thinking that he is coming by his own or even less than his own; for there can be no honour that is worthy of perfect virtue, yet he will at any rate accept it since they have nothing greater to bestow on him; but honour from casual people and on trifling grounds he will utterly despise, since it is not this that he deserves, and dishonour too, since in his case it cannot be just. In the first place, then, as has been said, the proud man is concerned with honours; yet he will also bear himself with moderation towards wealth and power and all good or evil fortune, whatever may befall him, and will be neither over-joyed by good fortune nor over-pained by evil. For not even towards honour does he bear himself as if it were a very great thing. Power and wealth are desirable for the sake of honour (at least those who have them wish to get honour by means of them); and for him to whom even honour is a little thing the others must be so too. Hence proud men are thought to be disdainful.

The goods of fortune also are thought to contribute towards pride. For men who are well-born are thought worthy of honour, and so are those who enjoy power or wealth; for they are in a superior position, and everything that has a superiority in something good is held in greater honour. Hence even such things make men prouder; for they are honoured by some for having them; but in truth the good man alone is to be honoured; he, however, who has both advantages is thought the more worthy of honour. But those who without virtue have such goods are neither justified in making great claims nor entitled to the name of 'proud'; for these things imply perfect virtue. Disdainful and insolent, however, even those who have such goods become. For without virtue it is not easy to bear gracefully the goods of fortune; and, being unable to bear them, and thinking themselves superior to others, they despise others and themselves do what they please. They imitate the proud man without being like him, and this they do where they can; so they do not act virtuously, but they do despise others. For the proud man despises justly (since he thinks truly), but the many do so at random.

He does not run into trifling dangers, nor is he fond of danger, because he honours few things; but he will face great dangers, and when he is in danger he is unsparing of his life, knowing that there are conditions on which life is not worth having. And he is the sort of man to confer benefits, but he is ashamed of receiving them; for the one is the mark of a superior, the other of an inferior. And he is apt to confer greater benefits in return; for thus the original benefactor besides being paid will incur a debt to him, and will be the gainer by the transaction. They seem also to remember any service they have done, but not those they have received (for he who receives a service is inferior to him who has done it, but the proud man wishes to be superior), and to hear of the former with pleasure, of the latter with displeasure; this, it seems, is why Thetis did not mention

to Zeus the services she had done him, and why the Spartans did not recount their services to the Athenians, but those they had received. It is a mark of the proud man also to ask for nothing or scarcely anything, but to give help readily, and to be dignified towards people who enjoy high position and good fortune, but unassuming towards those of the middle class; for it is a difficult and lofty thing to be superior to the former, but easy to be so to the latter, and a lofty bearing over the former is no mark of ill-breeding, but among humble people it is as vulgar as a display of strength against the weak. Again, it is characteristic of the proud man not to aim at the things commonly held in honour, or the things in which others excel; to be sluggish and to hold back except where great honour or a great work is at stake, and to be a man of few deeds, but of great and notable ones. He must also be open in his hate and in his love (for to conceal one's feelings, i.e. to care less for truth than for what people will think, is a coward's part), and must speak and act openly; for he is free of speech because he is contemptuous, and he is given to telling the truth, except when he speaks in irony to the vulgar. He must be unable to make his life revolve round another, unless it be a friend; for this is slavish, and for this reason all flatterers are servile and people lacking in self-respect are flatterers. Nor is he given to admiration; for nothing to him is great. Nor is he mindful of wrongs; for it is not the part of a proud man to have a long memory, especially for wrongs, but rather to overlook them. Nor is he a gossip; for he will speak neither about himself nor about another, since he cares not to be praised nor for others to be blamed; nor again is he given to praise; and for the same reason he is not an evil-speaker, even about his enemies, except from haughtiness. With regard to necessary or small matters he is least of all me given to lamentation or the asking of favours; for it is the part of one who takes such matters seriously to behave so with respect to them. He is one who will possess beautiful

and profitless things rather than profitable and useful ones; for this is more proper to a character that suffices to itself.

Further, a slow step is thought proper to the proud man, a deep voice, and a level utterance; for the man who takes few things seriously is not likely to be hurried, nor the man who thinks nothing great to be excited, while a shrill voice and a rapid gait are the results of hurry and excitement.

Such, then, is the proud man; the man who falls short of him is unduly humble, and the man who goes beyond him is vain. Now even these are not thought to be bad (for they are not malicious), but only mistaken. For the unduly humble man, being worthy of good things, robs himself of what he deserves, and to have something bad about him from the fact that he does not think himself worthy of good things, and seems also not to know himself; else he would have desired the things he was worthy of, since these were good. Yet such people are not thought to be fools, but rather unduly retiring. Such a reputation, however, seems actually to make them worse; for each class of people aims at what corresponds to its worth, and these people stand back even from noble actions and undertakings, deeming themselves unworthy, and from external goods no less. Vain people, on the other hand, are fools and ignorant of themselves, and that manifestly; for, not being worthy of them, they attempt honourable undertakings, and then are found out; and tetadorn themselves with clothing and outward show and such things, and wish their strokes of good fortune to be made public, and speak about them as if they would be honoured for them. But undue humility is more opposed to pride than vanity is; for it is both commoner and worse.

Pride, then, is concerned with honour on the grand scale, as has been said.

4

There seems to be in the sphere of honour also, as was said in our first remarks on the subject, a virtue which would appear to be related to pride as liberality is to magnificence. For neither of these has anything to do with the grand scale, but both dispose us as is right with regard to middling and unimportant objects; as in getting and giving of wealth there is a mean and an excess and defect, so too honour may be desired more than is right, or less, or from the right sources and in the right way. We blame both the ambitious man as am at honour more than is right and from wrong sources, and the unambitious man as not willing to be honoured even for noble reasons. But sometimes we praise the ambitious man as being manly and a lover of what is noble, and the unambitious man as being moderate and self-controlled, as we said in our first treatment of the subject. Evidently, since 'fond of such and such an object' has more than one meaning, we do not assign the term 'ambition' or 'love of honour' always to the same thing, but when we praise the quality we think of the man who loves honour more than most people, and when we blame it we think of him who loves it more than is right. The mean being without a name, the extremes seem to dispute for its place as though that were vacant by default. But where there is excess and defect, there is also an intermediate; now men desire honour both more than they should and less; therefore it is possible also to do so as one should; at all events this is the state of character that is praised, being an unnamed mean in respect of honour. Relatively to ambition it seems to be unambitiousness, and relatively to unambitiousness it seems to be ambition, while relatively to both severally it seems in a sense to be both together. This

appears to be true of the other virtues also. But in this case the extremes seem to be contradictories because the mean has not received a name.

5

Good temper is a mean with respect to anger; the middle state being unnamed, and the extremes almost without a name as well, we place good temper in the middle position, though it inclines towards the deficiency, which is without a name. The excess might called a sort of 'irascibility'. For the passion is anger, while its causes are many and diverse.

The man who is angry at the right things and with the right people, and, further, as he ought, when he ought, and as long as he ought, is praised. This will be the good-tempered man, then, since good temper is praised. For the good-tempered man tends to be unperturbed and not to be led by passion, but to be angry in the manner, at the things, and for the length of time, that the rule dictates; but he is thought to err rather in the direction of deficiency; for the good-tempered man is not revengeful, but rather tends to make allowances.

The deficiency, whether it is a sort of 'inirascibility' or whatever it is, is blamed. For those who are not angry at the things they should be angry at are thought to be fools, and so are those who are not angry in the right way, at the right time, or with the right persons; for such a man is thought not to feel things nor to be pained by them, and, since he does not get angry, he is thought unlikely to defend himself; and to endure being insulted and put up with insult to one's friends is slavish.

The excess can be manifested in all the points that have been named (for one can be angry with the wrong persons, at the wrong things, more than is right, too quickly, or too long); yet all are not found in the same person. Indeed they could not; for evil destroys even itself, and if it is complete becomes unbearable. Now hot-tempered people get angry quickly and with the wrong persons and at the wrong things and more than is right, but their anger ceases quickly – which is the best point about them. This happens to them because they do not restrain their anger but retaliate openly owing to their quickness of temper, and then their anger ceases. By reason of excess choleric people are quick-tempered and ready to be angry with everything and on every occasion; whence their name. Sulky people are hard to appease, and retain their anger long; for they repress their passion. But it ceases when they retaliate; for revenge relieves them of their anger, producing in them pleasure instead of pain. If this does not happen they retain their burden; for owing to its not being obvious no one even reasons with them, and to digest one's anger in oneself takes time. Such people are most troublesome to themselves and to their dearest friends. We call bad-tempered those who are angry at the wrong things, more than is right, and longer, and cannot be appeased until they inflict vengeance or punishment.

To good temper we oppose the excess rather than the defect; for not only is it commoner since revenge is the more human), but bad-tempered people are worse to live with.

What we have said in our earlier treatment of the subject is plain also from what we are now saying; viz. that it is not easy to define how, with whom, at what, and how long one should be angry, and at what point right action ceases and wrong begins. For the man who strays a little from the path, either towards the more or towards the less, is not blamed; since sometimes we praise those who exhibit the deficiency, and call them good-

tempered, and sometimes we call angry people manly, as being capable of ruling. How far, therefore, and how a man must stray before he becomes blameworthy, it is not easy to state in words; for the decision depends on the particular facts and on perception. But so much at least is plain, that the middle state is praiseworthy – that in virtue of which we are angry with the right people, at the right things, in the right way, and so on, while the excesses and defects are blameworthy – slightly so if they are present in a low degree, more if in a higher degree, and very much if in a high degree. Evidently, then, we must cling to the middle state. – Enough of the states relative to anger.

6

In gatherings of men, in social life and the interchange of words and deeds, some men are thought to be obsequious, viz. those who to give pleasure praise everything and never oppose, but think it their duty 'to give no pain to the people they meet'; while those who, on the contrary, oppose everything and care not a whit about giving pain are called churlish and contentious. That the states we have named are culpable is plain enough, and that the middle state is laudable – that in virtue of which a man will put up with, and will resent, the right things and in the right way; but no name has been assigned to it, though it most resembles friendship. For the man who corresponds to this middle state is very much what, with affection added, we call a good friend. But the state in question differs from friendship in that it implies no passion or affection for one's associates; since it is not by reason of loving or hating that such a man takes everything in the right way, but by being a man of a certain kind. For he will behave so alike towards those he knows and those he does not know, towards intimates

and those who are not so, except that in each of these cases he will behave as is befitting; for it is not proper to have the same care for intimates and for strangers, nor again is it the same conditions that make it right to give pain to them. Now we have said generally that he will associate with people in the right way; but it is by reference to what is honourable and expedient that he will aim at not giving pain or at contributing pleasure. For he seems to be concerned with the pleasures and pains of social life; and wherever it is not honourable, or is harmful, for him to contribute pleasure, he will refuse, and will choose rather to give pain; also if his acquiescence in another's action would bring disgrace, and that in a high degree, or injury, on that other, while his opposition brings a little pain, he will not acquiesce but will decline. He will associate differently with people in high station and with ordinary people, with closer and more distant acquaintances, and so too with regard to all other differences, rendering to each class what is befitting, and while for its own sake he chooses to contribute pleasure, and avoids the giving of pain, he will be guided by the consequences, if these are greater, i.e. honour and expediency. For the sake of a great future pleasure, too, he will inflict small pains.

The man who attains the mean, then, is such as we have described, but has not received a name; of those who contribute pleasure, the man who aims at being pleasant with no ulterior object is obsequious, but the man who does so in order that he may get some advantage in the direction of money or the things that money buys is a flatterer; while the man who quarrels with everything is, as has been said, churlish and contentious. And the extremes seem to be contradictory to each other because the mean is without a name.

7

The mean opposed to boastfulness is found in almost the same sphere; and this also is without a name. It will be no bad plan to describe these states as well; for we shall both know the facts about character better if we go through them in detail, and we shall be convinced that the virtues are means if we see this to be so in all cases. In the field of social life those who make the giving of pleasure or pain their object in associating with others have been described; let us now describe those who pursue truth or falsehood alike in words and deeds and in the claims they put forward. The boastful man, then, is thought to be apt to claim the things that bring glory, when he has not got them, or to claim more of them than he has, and the mock-modest man on the other hand to disclaim what he has or belittle it, while the man who observes the mean is one who calls a thing by its own name, being truthful both in life and in word, owning to what he has, and neither more nor less. Now each of these courses may be adopted either with or without an object. But each man speaks and acts and lives in accordance with his character, if he is not acting for some ulterior object. And falsehood is in itself mean and culpable, and truth noble and worthy of praise. Thus the truthful man is another case of a man who, being in the mean, is worthy of praise, and both forms of untruthful man are culpable, and particularly the boastful man.

Let us discuss them both, but first of all the truthful man. We are not speaking of the man who keeps faith in his agreements, i.e. in the things that pertain to justice or injustice (for this would belong to another virtue), but the man who in the matters in which nothing of this sort is at stake is true both in word and in life because his character is such. But such a man would seem to be as a matter of fact equitable. For the man who loves truth, and is truthful where nothing is at stake, will still

more be truthful where something is at stake; he will avoid falsehood as something base, seeing that he avoided it even for its own sake; and such a man is worthy of praise. He inclines rather to understate the truth; for this seems in better taste because exaggerations are wearisome.

He who claims more than he has with no ulterior object is a contemptible sort of fellow (otherwise he would not have delighted in falsehood), but seems futile rather than bad; but if he does it for an object, he who does it for the sake of reputation or honour is (for a boaster) not very much to be blamed, but he who does it for money, or the things that lead to money, is an uglier character (it is not the capacity that makes the boaster, but the purpose; for it is in virtue of his state of character and by being a man of a certain kind that he is boaster); as one man is a liar because he enjoys the lie itself, and another because he desires reputation or gain. Now those who boast for the sake of reputation claim such qualities as will praise or congratulation, but those whose object is gain claim qualities which are of value to one's neighbours and one's lack of which is not easily detected, e.g. the powers of a seer, a sage, or a physician. For this reason it is such things as these that most people claim and boast about; for in them the above-mentioned qualities are found.

Mock-modest people, who understate things, seem more attractive in character; for they are thought to speak not for gain but to avoid parade; and here too it is qualities which bring reputation that they disclaim, as Socrates used to do. Those who disclaim trifling and obvious qualities are called humbugs and are more contemptible; and sometimes this seems to be boastfulness, like the Spartan dress; for both excess and great deficiency are boastful. But those who use understatement with moderation and understate about matters that do not very much force themselves on our notice seem attractive. And it is

the boaster that seems to be opposed to the truthful man; for he is the worse character.

8

Since life includes rest as well as activity, and in this is included leisure and amusement, there seems here also to be a kind of intercourse which is tasteful; there is such a thing as saying – and again listening to – what one should and as one should. The kind of people one is speaking or listening to will also make a difference. Evidently here also there is both an excess and a deficiency as compared with the mean. Those who carry humour to excess are thought to be vulgar buffoons, striving after humour at all costs, and aiming rather at raising a laugh than at saying what is becoming and at avoiding pain to the object of their fun; while those who can neither make a joke themselves nor put up with those who do are thought to be boorish and unpolished. But those who joke in a tasteful way are called ready-witted, which implies a sort of readiness to turn this way and that; for such sallies are thought to be movements of the character, and as bodies are discriminated by their movements, so too are characters. The ridiculous side of things is not far to seek, however, and most people delight more than they should in amusement and in jestinly. and so even buffoons are called ready-witted because they are found attractive; but that they differ from the ready-witted man, and to no small extent, is clear from what has been said.

To the middle state belongs also tact; it is the mark of a tactful man to say and listen to such things as befit a good and well-bred man; for there are some things that it befits such a man to say and to hear by way of jest, and the well-bred man's jesting

differs from that of a vulgar man, and the joking of an educated man from that of an uneducated. One may see this even from the old and the new comedies; to the authors of the former indecency of language was amusing, to those of the latter innuendo is more so; and these differ in no small degree in respect of propriety. Now should we define the man who jokes well by his saying what is not unbecoming to a well-bred man, or by his not giving pain, or even giving delight, to the hearer? Or is the latter definition, at any rate, itself indefinite, since different things are hateful or pleasant to different people? The kind of jokes he will listen to will be the same; for the kind he can put up with are also the kind he seems to make. There are, then, jokes he will not make; for the jest is a sort of abuse, and there are things that lawgivers forbid us to abuse; and they should, perhaps, have forbidden us even to make a jest of such. The refined and well-bred man, therefore, will be as we have described, being as it were a law to himself.

Such, then, is the man who observes the mean, whether he be called tactful or ready-witted. The buffoon, on the other hand, is the slave of his sense of humour, and spares neither himself nor others if he can raise a laugh, and says things none of which a man of refinement would say, and to some of which he would not even listen. The boor, again, is useless for such social intercourse; for he contributes nothing and finds fault with everything. But relaxation and amusement are thought to be a necessary element in life.

The means in life that have been described, then, are three in number, and are all concerned with an interchange of words and deeds of some kind. They differ, however, in that one is concerned with truth; and the other two with pleasantness. Of those concerned with pleasure, one is displayed in jests, the other in the general social intercourse of life.

9

Shame should not be described as a virtue; for it is more like a feeling than a state of character. It is defined, at any rate, as a kind of fear of dishonour, and produces an effect similar to that produced by fear of danger; for people who feel disgraced blush, and those who fear death turn pale. Both, therefore, seem to be in a sense bodily conditions, which is thought to be characteristic of feeling rather than of a state of character.

The feeling is not becoming to every age, but only to youth. For we think young people should be prone to the feeling of shame because they live by feeling and therefore commit many errors, but are restrained by shame; and we praise young people who are prone to this feeling, but an older person no one would praise for being prone to the sense of disgrace, since we think he should not do anything that need cause this sense. For the sense of disgrace is not even characteristic of a good man, since it is consequent on bad actions (for such actions should not be done; and if some actions are disgraceful in very truth and others only according to common opinion, this makes no difference; for neither class of actions should be done, so that no disgrace should be felt); and it is a mark of a bad man even to be such as to do any disgraceful action. To be so constituted as to feel disgraced if one does such an action, and for this reason to think oneself good, is absurd; for it is for voluntary actions that shame is felt, and the good man will never voluntarily do bad actions. But shame may be said to be conditionally a good thing; if a good man does such actions, he will feel disgraced; but the virtues are not subject to such a qualification. And if shamelessness – not to be ashamed of doing base actions – is bad, that does not make it good to be

ashamed of doing such actions. Continence too is not virtue, but a mixed sort of state; this will be shown later. Now, however, let us discuss justice.

Book V

1

With regards to justice and injustice we must (1) consider what kind of actions they are concerned with, (2) what sort of mean justice is, and (3) between what extremes the just act is intermediate. Our investigation shall follow the same course as the preceding discussions.

We see that all men mean by justice that kind of state of character which makes people disposed to do what is just and makes them act justly and wish for what is just; and similarly by injustice that state which makes them act unjustly and wish for what is unjust. Let us too, then, lay this down as a general basis. For the same is not true of the sciences and the faculties as of states of character. A faculty or a science which is one and the same is held to relate to contrary objects, but a state of character which is one of two contraries does not produce the contrary results; e.g. as a result of health we do not do what is the opposite of healthy, but only what is healthy; for we say a man walks healthily, when he walks as a healthy man would.

Now often one contrary state is recognized from its contrary, and often states are recognized from the subjects that exhibit them; for (A) if good condition is known, bad condition also becomes known, and (B) good condition is known from the things that are in good condition, and they from it. If good condition is firmness of flesh, it is necessary both that bad condition should be flabbiness of flesh and that the wholesome should be that which causes firmness in flesh. And it follows for the most part that if one contrary is ambiguous the other also will be ambiguous; e.g. if 'just' is so, that 'unjust' will be so too.

Now 'justice' and 'injustice' seem to be ambiguous, but because their different meanings approach near to one another the ambiguity escapes notice and is not obvious as it is, comparatively, when the meanings are far apart, e.g. (for here the difference in outward form is great) as the ambiguity in the use of kleis for the collar-bone of an animal and for that with which we lock a door. Let us take as a starting-point, then, the various meanings of 'an unjust man'. Both the lawless man and the grasping and unfair man are thought to be unjust, so that evidently both the law-abiding and the fair man will be just. The just, then, is the lawful and the fair, the unjust the unlawful and the unfair.

Since the unjust man is grasping, he must be concerned with goods – not all goods, but those with which prosperity and adversity have to do, which taken absolutely are always good, but for a particular person are not always good. Now men pray for and pursue these things; but they should not, but should pray that the things that are good absolutely may also be good for them, and should choose the things that are good for them. The unjust man does not always choose the greater, but also the less – in the case of things bad absolutely; but because the lesser evil is itself thought to be in a sense good, and graspingness is directed at the good, therefore he is thought to

be grasping. And he is unfair; for this contains and is common to both.

Since the lawless man was seen to be unjust and the law-abiding man just, evidently all lawful acts are in a sense just acts; for the acts laid down by the legislative art are lawful, and each of these, we say, is just. Now the laws in their enactments on all subjects aim at the common advantage either of all or of the best or of those who hold power, or something of the sort; so that in one sense we call those acts just that tend to produce and preserve happiness and its components for the political society. And the law bids us do both the acts of a brave man (e.g. not to desert our post nor take to flight nor throw away our arms), and those of a temperate man (e.g. not to commit adultery nor to gratify one's lust), and those of a good-tempered man (e.g. not to strike another nor to speak evil), and similarly with regard to the other virtues and forms of wickedness, commanding some acts and forbidding others; and the rightly-framed law does this rightly, and the hastily conceived one less well. This form of justice, then, is complete virtue, but not absolutely, but in relation to our neighbour. And therefore justice is often thought to be the greatest of virtues, and 'neither evening nor morning star' is so wonderful; and proverbially 'in justice is every virtue comprehended'. And it is complete virtue in its fullest sense, because it is the actual exercise of complete virtue. It is complete because he who possesses it can exercise his virtue not only in himself but towards his neighbour also; for many men can exercise virtue in their own affairs, but not in their relations to their neighbour. This is why the saying of Bias is thought to be true, that 'rule will show the man'; for a ruler is necessarily in relation to other men and a member of a society. For this same reason justice, alone of the virtues, is thought to be 'another's good', because it is related to our neighbour; for it does what is advantageous to another, either a ruler or a copartner. Now the worst man is he

who exercises his wickedness both towards himself and towards his friends, and the best man is not he who exercises his virtue towards himself but he who exercises it towards another; for this is a difficult task. Justice in this sense, then, is not part of virtue but virtue entire, nor is the contrary injustice a part of vice but vice entire. What the difference is between virtue and justice in this sense is plain from what we have said; they are the same but their essence is not the same; what, as a relation to one's neighbour, is justice is, as a certain kind of state without qualification, virtue.

2

But at all events what we are investigating is the justice which is a part of virtue; for there is a justice of this kind, as we maintain. Similarly it is with injustice in the particular sense that we are concerned.

That there is such a thing is indicated by the fact that while the man who exhibits in action the other forms of wickedness acts wrongly indeed, but not graspingly (e.g. the man who throws away his shield through cowardice or speaks harshly through bad temper or fails to help a friend with money through meanness), when a man acts graspingly he often exhibits none of these vices, – no, nor all together, but certainly wickedness of some kind (for we blame him) and injustice. There is, then, another kind of injustice which is a part of injustice in the wide sense, and a use of the word 'unjust' which answers to a part of what is unjust in the wide sense of 'contrary to the law'. Again if one man commits adultery for the sake of gain and makes money by it, while another does so at the bidding of appetite though he loses money and is penalized for it, the latter would

be held to be self-indulgent rather than grasping, but the former is unjust, but not self-indulgent; evidently, therefore, he is unjust by reason of his making gain by his act. Again, all other unjust acts are ascribed invariably to some particular kind of wickedness, e.g. adultery to self-indulgence, the desertion of a comrade in battle to cowardice, physical violence to anger; but if a man makes gain, his action is ascribed to no form of wickedness but injustice. Evidently, therefore, there is apart from injustice in the wide sense another, 'particular', injustice which shares the name and nature of the first, because its definition falls within the same genus; for the significance of both consists in a relation to one's neighbour, but the one is concerned with honour or money or safety – or that which includes all these, if we had a single name for it – and its motive is the pleasure that arises from gain; while the other is concerned with all the objects with which the good man is concerned.

It is clear, then, that there is more than one kind of justice, and that there is one which is distinct from virtue entire; we must try to grasp its genus and differentia.

The unjust has been divided into the unlawful and the unfair, and the just into the lawful and the fair. To the unlawful answers the afore-mentioned sense of injustice. But since unfair and the unlawful are not the same, but are different as a part is from its whole (for all that is unfair is unlawful, but not all that is unlawful is unfair), the unjust and injustice in the sense of the unfair are not the same as but different from the former kind, as part from whole; for injustice in this sense is a part of injustice in the wide sense, and similarly justice in the one sense of justice in the other. Therefore we must speak also about particular justice and particular and similarly about the just and the unjust. The justice, then, which answers to the whole of virtue, and the corresponding injustice, one being the

exercise of virtue as a whole, and the other that of vice as a whole, towards one's neighbour, we may leave on one side. And how the meanings of 'just' and 'unjust' which answer to these are to be distinguished is evident; for practically the majority of the acts commanded by the law are those which are prescribed from the point of view of virtue taken as a whole; for the law bids us practise every virtue and forbids us to practise any vice. And the things that tend to produce virtue taken as a whole are those of the acts prescribed by the law which have been prescribed with a view to education for the common good. But with regard to the education of the individual as such, which makes him without qualification a good man, we must determine later whether this is the function of the political art or of another; for perhaps it is not the same to be a good man and a good citizen of any state taken at random.

Of particular justice and that which is just in the corresponding sense, (A) one kind is that which is manifested in distributions of honour or money or the other things that fall to be divided among those who have a share in the constitution (for in these it is possible for one man to have a share either unequal or equal to that of another), and (B) one is that which plays a rectifying part in transactions between man and man. Of this there are two divisions; of transactions (1) some are voluntary and (2) others involuntary – voluntary such transactions as sale, purchase, loan for consumption, pledging, loan for use, depositing, letting (they are called voluntary because the origin of these transactions is voluntary), while of the involuntary (a) some are clandestine, such as theft, adultery, poisoning, procuring, enticement of slaves, assassination, false witness, and (b) others are violent, such as assault, imprisonment, murder, robbery with violence, mutilation, abuse, insult.

3

(A) We have shown that both the unjust man and the unjust act are unfair or unequal; now it is clear that there is also an intermediate between the two unequals involved in either case. And this is the equal; for in any kind of action in which there's a more and a less there is also what is equal. If, then, the unjust is unequal, just is equal, as all men suppose it to be, even apart from argument. And since the equal is intermediate, the just will be an intermediate. Now equality implies at least two things. The just, then, must be both intermediate and equal and relative (i.e. for certain persons). And since the equall intermediate it must be between certain things (which are respectively greater and less); equal, it involves two things; qua just, it is for certain people. The just, therefore, involves at least four terms; for the persons for whom it is in fact just are two, and the things in which it is manifested, the objects distributed, are two. And the same equality will exist between the persons and between the things concerned; for as the latter the things concerned are related, so are the former; if they are not equal, they will not have what is equal, but this is the origin of quarrels and complaints – when either equals have and are awarded unequal shares, or unequals equal shares. Further, this is plain from the fact that awards should be 'according to merit'; for all men agree that what is just in distribution must be according to merit in some sense, though they do not all specify the same sort of merit, but democrats identify it with the status of freeman, supporters of oligarchy with wealth (or with noble birth), and supporters of aristocracy with excellence.

The just, then, is a species of the proportionate (proportion being not a property only of the kind of number which consists of abstract units, but of number in general). For proportion is

equality of ratios, and involves four terms at least (that discrete proportion involves four terms is plain, but so does continuous proportion, for it uses one term as two and mentions it twice; e.g. 'as the line A is to the line B, so is the line B to the line C'; the line B, then, has been mentioned twice, so that if the line B be assumed twice, the proportional terms will be four); and the just, too, involves at least four terms, and the ratio between one pair is the same as that between the other pair; for there is a similar distinction between the persons and between the things. As the term A, then, is to B, so will C be to D, and therefore, alternando, as A is to C, B will be to D. Therefore also the whole is in the same ratio to the whole; and this coupling the distribution effects, and, if the terms are so combined, effects justly. The conjunction, then, of the term A with C and of B with D is what is just in distribution, and this species of the just is intermediate, and the unjust is what violates the proportion; for the proportional is intermediate, and the just is proportional. (Mathematicians call this kind of proportion geometrical; for it is in geometrical proportion that it follows that the whole is to the whole as either part is to the corresponding part.) This proportion is not continuous; for we cannot get a single term standing for a person and a thing.

This, then, is what the just is – the proportional; the unjust is what violates the proportion. Hence one term becomes too great, the other too small, as indeed happens in practice; for the man who acts unjustly has too much, and the man who is unjustly treated too little, of what is good. In the case of evil the reverse is true; for the lesser evil is reckoned a good in comparison with the greater evil, since the lesser evil is rather to be chosen than the greater, and what is worthy of choice is good, and what is worthier of choice a greater good.

This, then, is one species of the just.

4

(B) The remaining one is the rectificatory, which arises in connexion with transactions both voluntary and involuntary. This form of the just has a different specific character from the former. For the justice which distributes common possessions is always in accordance with the kind of proportion mentioned above (for in the case also in which the distribution is made from the common funds of a partnership it will be according to the same ratio which the funds put into the business by the partners bear to one another); and the injustice opposed to this kind of justice is that which violates the proportion. But the justice in transactions between man and man is a sort of equality indeed, and the injustice a sort of inequality; not according to that kind of proportion, however, but according to arithmetical proportion. For it makes no difference whether a good man has defrauded a bad man or a bad man a good one, nor whether it is a good or a bad man that has committed adultery; the law looks only to the distinctive character of the injury, and treats the parties as equal, if one is in the wrong and the other is being wronged, and if one inflicted injury and the other has received it. Therefore, this kind of injustice being an inequality, the judge tries to equalize it; for in the case also in which one has received and the other has inflicted a wound, or one has slain and the other been slain, the suffering and the action have been unequally distributed; but the judge tries to equalize by means of the penalty, taking away from the gain of the assailant. For the term 'gain' is applied generally to such cases, even if it be not a term appropriate to certain cases, e.g. to the person who inflicts a woundand 'loss' to the sufferer; at all events when the suffering has been estimated, the one is called

loss and the other gain. Therefore the equal is intermediate between the greater and the less, but the gain and the loss are respectively greater and less in contrary ways; more of the good and less of the evil are gain, and the contrary is loss; intermediate between them is, as we saw, equal, which we say is just; therefore corrective justice will be the intermediate between loss and gain. This is why, when people dispute, they take refuge in the judge; and to go to the judge is to go to justice; for the nature of the judge is to be a sort of animate justice; and they seek the judge as an intermediate, and in some states they call judges mediators, on the assumption that if they get what is intermediate they will get what is just. The just, then, is an intermediate, since the judge is so. Now the judge restores equality; it is as though there were a line divided into unequal parts, and he took away that by which the greater segment exceeds the half, and added it to the smaller segment. And when the whole has been equally divided, then they say they have 'their own' – i.e. when they have got what is equal. The equal is intermediate between the greater and the lesser line according to arithmetical proportion. It is for this reason also that it is called just (sikaion), because it is a division into two equal parts (sicha), just as if one were to call it sichaion; and the judge (sikastes) is one who bisects (sichastes). For when something is subtracted from one of two equals and added to the other, the other is in excess by these two; since if what was taken from the one had not been added to the other, the latter would have been in excess by one only. It therefore exceeds the intermediate by one, and the intermediate exceeds by one that from which something was taken. By this, then, we shall recognize both what we must subtract from that which has more, and what we must add to that which has less; we must add to the latter that by which the intermediate exceeds it, and subtract from the greatest that by which it exceeds the intermediate. Let the lines AA', BB', CC' be equal to one another;

from the line AA' let the segment AE have been subtracted, and to the line CC' let the segment CD have been added, so that the whole line DCC' exceeds the line EA' by the segment CD and the segment CF; therefore it exceeds the line BB' by the segment CD. (See diagram.)

These names, both loss and gain, have come from voluntary exchange; for to have more than one's own is called gaining, and to have less than one's original share is called losing, e.g. in buying and selling and in all other matters in which the law has left people free to make their own terms; but when they get neither more nor less but just what belongs to themselves, they say that they have their own and that they neither lose nor gain.

Therefore the just is intermediate between a sort of gain and a sort of loss, viz. those which are involuntary; it consists in having an equal amount before and after the transaction.

5

Some think that reciprocity is without qualification just, as the Pythagoreans said; for they defined justice without qualification as reciprocity. Now 'reciprocity' fits neither distributive nor rectificatory justice – yet people want even the justice of Rhadamanthus to mean this:

Should a man suffer what he did, right justice would be done – for in many cases reciprocity and rectificatory justice are not in accord; e.g. (1) if an official has inflicted a wound, he should not be wounded in return, and if some one has wounded an official, he ought not to be wounded only but punished in addition. Further (2) there is a great difference between a voluntary and

an involuntary act. But in associations for exchange this sort of justice does hold men together – reciprocity in accordance with a proportion and not on the basis of precisely equal return. For it is by proportionate requital that the city holds together. Men seek to return either evil for evil – and if they cannot do so, think their position mere slavery – or good for good – and if they cannot do so there is no exchange, but it is by exchange that they hold together. This is why they give a prominent place to the temple of the Graces – to promote the requital of services; for this is characteristic of grace – we should serve in return one who has shown grace to us, and should another time take the initiative in showing it.

Now proportionate return is secured by cross-conjunction. Let A be a builder, B a shoemaker, C a house, D a shoe. The builder, then, must get from the shoemaker the latter's work, and must himself give him in return his own. If, then, first there is proportionate equality of goods, and then reciprocal action takes place, the result we mention will be effected. If not, the bargain is not equal, and does not hold; for there is nothing to prevent the work of the one being better than that of the other; they must therefore be equated. (And this is true of the other arts also; for they would have been destroyed if what the patient suffered had not been just what the agent did, and of the same amount and kind.) For it is not two doctors that associate for exchange, but a doctor and a farmer, or in general people who are different and unequal; but these must be equated. This is why all things that are exchanged must be somehow comparable. It is for this end that money has been introduced, and it becomes in a sense an intermediate; for it measures all things, and therefore the excess and the defect – how many shoes are equal to a house or to a given amount of food. The number of shoes exchanged for a house (or for a given amount of food) must therefore correspond to the ratio of builder to shoemaker. For if this be not so, there will be no

exchange and no intercourse. And this proportion will not be effected unless the goods are somehow equal. All goods must therefore be measured by some one thing, as we said before. Now this unit is in truth demand, which holds all things together (for if men did not need one another's goods at all, or did not need them equally, there would be either no exchange or not the same exchange); but money has become by convention a sort of representative of demand; and this is why it has the name 'money' (nomisma) – because it exists not by nature but by law (nomos) and it is in our power to change it and make it useless. There will, then, be reciprocity when the terms have been equated so that as farmer is to shoemaker, the amount of the shoemaker's work is to that of the farmer's work for which it exchanges. But we must not bring them into a figure of proportion when they have already exchanged (otherwise one extreme will have both excesses), but when they still have their own goods. Thus they are equals and associates just because this equality can be effected in their case. Let A be a farmer, C food, B a shoemaker, D his product equated to C. If it had not been possible for reciprocity to be thus effected, there would have been no association of the parties. That demand holds things together as a single unit is shown by the fact that when men do not need one another, i.e. when neither needs the other or one does not need the other, they do not exchange, as we do when some one wants what one has oneself, e.g. when people permit the exportation of corn in exchange for wine. This equation therefore must be established. And for the future exchange – that if we do not need a thing now we shall have it if ever we do need it – money is as it were our surety; for it must be possible for us to get what we want by bringing the money. Now the same thing happens to money itself as to goods – it is not always worth the same; yet it tends to be steadier. This is why all goods must have a price set on them; for then there will always be exchange, and if so, association of man with man.

Money, then, acting as a measure, makes goods commensurate and equates them; for neither would there have been association if there were not exchange, nor exchange if there were not equality, nor equality if there were not commensurability. Now in truth it is impossible that things differing so much should become commensurate, but with reference to demand they may become so sufficiently. There must, then, be a unit, and that fixed by agreement (for which reason it is called money); for it is this that makes all things commensurate, since all things are measured by money. Let A be a house, B ten minae, C a bed. A is half of B, if the house is worth five minae or equal to them; the bed, C, is a tenth of B; it is plain, then, how many beds are equal to a house, viz. five. That exchange took place thus before there was money is plain; for it makes no difference whether it is five beds that exchange for a house, or the money value of five beds.

We have now defined the unjust and the just. These having been marked off from each other, it is plain that just action is intermediate between acting unjustly and being unjustly treated; for the one is to have too much and the other to have too little. Justice is a kind of mean, but not in the same way as the other virtues, but because it relates to an intermediate amount, while injustice relates to the extremes. And justice is that in virtue of which the just man is said to be a doer, by choice, of that which is just, and one who will distribute either between himself and another or between two others not so as to give more of what is desirable to himself and less to his neighbour (and conversely with what is harmful), but so as to give what is equal in accordance with proportion; and similarly in distributing between two other persons. Injustice on the other hand is similarly related to the unjust, which is excess and defect, contrary to proportion, of the useful or hurtful. For which reason injustice is excess and defect, viz. because it is productive of excess and defect – in one’s own case excess of

what is in its own nature useful and defect of what is hurtful, while in the case of others it is as a whole like what it is in one's own case, but proportion may be violated in either direction. In the unjust act to have too little is to be unjustly treated; to have too much is to act unjustly.

Let this be taken as our account of the nature of justice and injustice, and similarly of the just and the unjust in general.

6

Since acting unjustly does not necessarily imply being unjust, we must ask what sort of unjust acts imply that the doer is unjust with respect to each type of injustice, e.g. a thief, an adulterer, or a brigand. Surely the answer does not turn on the difference between these types. For a man might even lie with a woman knowing who she was, but the origin of his might be not deliberate choice but passion. He acts unjustly, then, but is not unjust; e.g. a man is not a thief, yet he stole, nor an adulterer, yet he committed adultery; and similarly in all other cases.

Now we have previously stated how the reciprocal is related to the just; but we must not forget that what we are looking for is not only what is just without qualification but also political justice. This is found among men who share their life with a view to selfsufficiency, men who are free and either proportionately or arithmetically equal, so that between those who do not fulfil this condition there is no political justice but justice in a special sense and by analogy. For justice exists only between men whose mutual relations are governed by law; and law exists for men between whom there is injustice; for legal justice is the discrimination of the just and the unjust. And between men between whom there is injustice there is also

unjust action (though there is not injustice between all between whom there is unjust action), and this is assigning too much to oneself of things good in themselves and too little of things evil in themselves. This is why we do not allow a man to rule, but rational principle, because a man behaves thus in his own interests and becomes a tyrant. The magistrate on the other hand is the guardian of justice, and, if of justice, then of equality also. And since he is assumed to have no more than his share, if he is just (for he does not assign to himself more of what is good in itself, unless such a share is proportional to his merits – so that it is for others that he labours, and it is for this reason that men, as we stated previously, say that justice is 'another's good'), therefore a reward must be given him, and this is honour and privilege; but those for whom such things are not enough become tyrants.

The justice of a master and that of a father are not the same as the justice of citizens, though they are like it; for there can be no injustice in the unqualified sense towards thing that are one's own, but a man's chattel, and his child until it reaches a certain age and sets up for itself, are as it were part of himself, and no one chooses to hurt himself (for which reason there can be no injustice towards oneself). Therefore the justice or injustice of citizens is not manifested in these relations; for it was as we saw according to law, and between people naturally subject to law, and these as we saw' are people who have an equal share in ruling and being ruled. Hence justice can more truly be manifested towards a wife than towards children and chattels, for the former is household justice; but even this is different from political justice.

7

Of political justice part is natural, part legal, natural, that which everywhere has the same force and does not exist by people's thinking this or that; legal, that which is originally indifferent, but when it has been laid down is not indifferent, e.g. that a prisoner's ransom shall be a mina, or that a goat and not two sheep shall be sacrificed, and again all the laws that are passed for particular cases, e.g. that sacrifice shall be made in honour of Brasidas, and the provisions of decrees. Now some think that all justice is of this sort, because that which is by nature is unchangeable and has everywhere the same force (as fire burns both here and in Persia), while they see change in the things recognized as just. This, however, is not true in this unqualified way, but is true in a sense; or rather, with the gods it is perhaps not true at all, while with us there is something that is just even by nature, yet all of it is changeable; but still some is by nature, some not by nature. It is evident which sort of thing, among things capable of being otherwise, is by nature, and which is not but is legal and conventional, assuming that both are equally changeable. And in all other things the same distinction will apply; by nature the right hand is stronger, yet it is possible that all men should come to be ambidextrous. The things which are just by virtue of convention and expediency are like measures; for wine and corn measures are not everywhere equal, but larger in wholesale and smaller in retail markets. Similarly, the things which are just not by nature but by human enactment are not everywhere the same, since constitutions also are not the same, though there is but one which is everywhere by nature the best. Of things just and lawful each is related as the universal to its particulars; for the things that are done are many, but of them each is one, since it is universal.

There is a difference between the act of injustice and what is unjust, and between the act of justice and what is just; for a

thing is unjust by nature or by enactment; and this very thing, when it has been done, is an act of injustice, but before it is done is not yet that but is unjust. So, too, with an act of justice (though the general term is rather ‘just action’, and ‘act of justice’ is applied to the correction of the act of injustice).

Each of these must later be examined separately with regard to the nature and number of its species and the nature of the things with which it is concerned.

8

Acts just and unjust being as we have described them, a man acts unjustly or justly whenever he does such acts voluntarily; when involuntarily, he acts neither unjustly nor justly except in an incidental way; for he does things which happen to be just or unjust. Whether an act is or is not one of injustice (or of justice) is determined by its voluntariness or involuntariness; for when it is voluntary it is blamed, and at the same time is then an act of injustice; so that there will be things that are unjust but not yet acts of injustice, if voluntariness be not present as well. By the voluntary I mean, as has been said before, any of the things in a man’s own power which he does with knowledge, i.e. not in ignorance either of the person acted on or of the instrument used or of the end that will be attained (e.g. whom he is striking, with what, and to what end), each such act being done not incidentally nor under compulsion (e.g. if A takes B’s hand and therewith strikes C, B does not act voluntarily; for the act was not in his own power). The person struck may be the striker’s father, and the striker may know that it is a man or one of the persons present, but not know that it is his father; a similar distinction may be made in the case of the end, and with regard

to the whole action. Therefore that which is done in ignorance, or though not done in ignorance is not in the agent's power, or is done under compulsion, is involuntary (for many natural processes, even, we knowingly both perform and experience, none of which is either voluntary or involuntary; e.g. growing old or dying). But in the case of unjust and just acts alike the injustice or justice may be only incidental; for a man might return a deposit unwillingly and from fear, and then he must not be said either to do what is just or to act justly, except in an incidental way. Similarly the man who under compulsion and unwillingly fails to return the deposit must be said to act unjustly, and to do what is unjust, only incidentally. Of voluntary acts we do some by choice, others not by choice; by choice those which we do after deliberation, not by choice those which we do without previous deliberation. Thus there are three kinds of injury in transactions between man and man; those done in ignorance are mistakes when the person acted on, the act, the instrument, or the end that will be attained is other than the agent supposed; the agent thought either that he was not hiting any one or that he was not hitting with this missile or not hitting this person or to this end, but a result followed other than that which he thought likely (e.g. he threw not with intent to wound but only to prick), or the person hit or the missile was other than he supposed. Now when (1) the injury takes place contrary to reasonable expectation, it is a misadventure. When (2) it is not contrary to reasonable expectation, but does not imply vice, it is a mistake (for a man makes a mistake when the fault originates in him, but is the victim of accident when the origin lies outside him). When (3) he acts with knowledge but not after deliberation, it is an act of injustice – e.g. the acts due to anger or to other passions necessary or natural to man; for when men do such harmful and mistaken acts they act unjustly, and the acts are acts of injustice, but this does not imply that the doers are unjust or wicked; for the injury is not

due to vice. But when (4) a man acts from choice, he is an unjust man and a vicious man.

Hence acts proceeding from anger are rightly judged not to be done of malice aforethought; for it is not the man who acts in anger but he who enraged him that starts the mischief. Again, the matter in dispute is not whether the thing happened or not, but its justice; for it is apparent injustice that occasions rage. For they do not dispute about the occurrence of the act – as in commercial transactions where one of the two parties must be vicious – unless they do so owing to forgetfulness; but, agreeing about the fact, they dispute on which side justice lies (whereas a man who has deliberately injured another cannot help knowing that he has done so), so that the one thinks he is being treated unjustly and the other disagrees.

But if a man harms another by choice, he acts unjustly; and these are the acts of injustice which imply that the doer is an unjust man, provided that the act violates proportion or equality. Similarly, a man is just when he acts justly by choice; but he acts justly if he merely acts voluntarily.

Of involuntary acts some are excusable, others not. For the mistakes which men make not only in ignorance but also from ignorance are excusable, while those which men do not from ignorance but (though they do them in ignorance) owing to a passion which is neither natural nor such as man is liable to, are not excusable.

9

Assuming that we have sufficiently defined the suffering and doing of injustice, it may be asked (1) whether the truth in expressed in Euripides' paradoxical words:

I slew my mother, that's my tale in brief.

Were you both willing, or unwilling both?

Is it truly possible to be willingly treated unjustly, or is all suffering of injustice the contrary involuntary, as all unjust action is voluntary? And is all suffering of injustice of the latter kind or else all of the former, or is it sometimes voluntary, sometimes involuntary? So, too, with the case of being justly treated; all just action is voluntary, so that it is reasonable that there should be a similar opposition in either case – that both being unjustly and being justly treated should be either alike voluntary or alike involuntary. But it would be thought paradoxical even in the case of being justly treated, if it were always voluntary; for some are unwillingly treated justly. (2) One might raise this question also, whether every one who has suffered what is unjust is being unjustly treated, or on the other hand it is with suffering as with acting. In action and in passivity alike it is possible to partake of justice incidentally, and similarly (it is plain) of injustice; for to do what is unjust is not the same as to act unjustly, nor to suffer what is unjust as to be treated unjustly, and similarly in the case of acting justly and being justly treated; for it is impossible to be unjustly treated if the other does not act unjustly, or justly treated unless he acts justly. Now if to act unjustly is simply to harm some one voluntarily, and 'voluntarily' means 'knowing the person acted on, the instrument, and the manner of one's acting', and the incontinent man voluntarily harms himself, not only will he voluntarily be unjustly treated but it will be possible to treat oneself unjustly. (This also is one of the questions in doubt,

whether a man can treat himself unjustly.) Again, a man may voluntarily, owing to incontinence, be harmed by another who acts voluntarily, so that it would be possible to be voluntarily treated unjustly. Or is our definition incorrect; must we to 'harming another, with knowledge both of the person acted on, of the instrument, and of the manner' add 'contrary to the wish of the person acted on'? Then a man may be voluntarily harmed and voluntarily suffer what is unjust, but no one is voluntarily treated unjustly; for no one wishes to be unjustly treated, not even the incontinent man. He acts contrary to his wish; for no one wishes for what he does not think to be good, but the incontinent man does do things that he does not think he ought to do. Again, one who gives what is his own, as Homer says Glaucus gave Diomede Armour of gold for brazen, the price of a hundred beeves for nine, is not unjustly treated; for though to give is in his power, to be unjustly treated is not, but there must be some one to treat him unjustly. It is plain, then, that being unjustly treated is not voluntary.

Of the questions we intended to discuss two still remain for discussion; (3) whether it is the man who has assigned to another more than his share that acts unjustly, or he who has the excessive share, and (4) whether it is possible to treat oneself unjustly. The questions are connected; for if the former alternative is possible and the distributor acts unjustly and not the man who has the excessive share, then if a man assigns more to another than to himself, knowingly and voluntarily, he treats himself unjustly; which is what modest people seem to do, since the virtuous man tends to take less than his share. Or does this statement too need qualification? For (a) he perhaps gets more than his share of some other good, e.g. of honour or of intrinsic nobility. (b) The question is solved by applying the distinction we applied to unjust action; for he suffers nothing contrary to his own wish, so that he is not unjustly treated as far as this goes, but at most only suffers harm.

It is plain too that the distributor acts unjustly, but not always the man who has the excessive share; for it is not he to whom what is unjust appertains that acts unjustly, but he to whom it appertains to do the unjust act voluntarily, i.e. the person in whom lies the origin of the action, and this lies in the distributor, not in the receiver. Again, since the word ‘do’ is ambiguous, and there is a sense in which lifeless things, or a hand, or a servant who obeys an order, may be said to slay, he who gets an excessive share does not act unjustly, though he ‘does’ what is unjust.

Again, if the distributor gave his judgement in ignorance, he does not act unjustly in respect of legal justice, and his judgement is not unjust in this sense, but in a sense it is unjust (for legal justice and primordial justice are different); but if with knowledge he judged unjustly, he is himself aiming at an excessive share either of gratitude or of revenge. As much, then, as if he were to share in the plunder, the man who has judged unjustly for these reasons has got too much; the fact that what he gets is different from what he distributes makes no difference, for even if he awards land with a view to sharing in the plunder he gets not land but money.

Men think that acting unjustly is in their power, and therefore that being just is easy. But it is not; to lie with one’s neighbour’s wife, to wound another, to deliver a bribe, is easy and in our power, but to do these things as a result of a certain state of character is neither easy nor in our power. Similarly to know what is just and what is unjust requires, men think, no great wisdom, because it is not hard to understand the matters dealt with by the laws (though these are not the things that are just, except incidentally); but how actions must be done and distributions effected in order to be just, to know this is a greater achievement than knowing what is good for the health; though even there, while it is easy to know that honey, wine,

hellebore, cautery, and the use of the knife are so, to know how, to whom, and when these should be applied with a view to producing health, is no less an achievement than that of being a physician. Again, for this very reason men think that acting unjustly is characteristic of the just man no less than of the unjust, because he would be not less but even more capable of doing each of these unjust acts; for he could lie with a woman or wound a neighbour; and the brave man could throw away his shield and turn to flight in this direction or in that. But to play the coward or to act unjustly consists not in doing these things, except incidentally, but in doing them as the result of a certain state of character, just as to practise medicine and healing consists not in applying or not applying the knife, in using or not using medicines, but in doing so in a certain way.

Just acts occur between people who participate in things good in themselves and can have too much or too little of them; for some beings (e.g. presumably the gods) cannot have too much of them, and to others, those who are incurably bad, not even the smallest share in them is beneficial but all such goods are harmful, while to others they are beneficial up to a point; therefore justice is essentially something human.

10

Our next subject is equity and the equitable (to epiekes), and their respective relations to justice and the just. For on examination they appear to be neither absolutely the same nor generically different; and while we sometime praise what is equitable and the equitable man (so that we apply the name by way of praise even to instances of the other virtues, instead of 'good' meaning by epieikestebon that a thing is better), at other

times, when we reason it out, it seems strange if the equitable, being something different from the just, is yet praiseworthy; for either the just or the equitable is not good, if they are different; or, if both are good, they are the same.

These, then, are pretty much the considerations that give rise to the problem about the equitable; they are all in a sense correct and not opposed to one another; for the equitable, though it is better than one kind of justice, yet is just, and it is not as being a different class of thing that it is better than the just. The same thing, then, is just and equitable, and while both are good the equitable is superior. What creates the problem is that the equitable is just, but not the legally just but a correction of legal justice. The reason is that all law is universal but about some things it is not possible to make a universal statement which shall be correct. In those cases, then, in which it is necessary to speak universally, but not possible to do so correctly, the law takes the usual case, though it is not ignorant of the possibility of error. And it is none the less correct; for the error is in the law nor in the legislator but in the nature of the thing, since the matter of practical affairs is of this kind from the start. When the law speaks universally, then, and a case arises on it which is not covered by the universal statement, then it is right, where the legislator fails us and has erred by oversimplicity, to correct the omission – to say what the legislator himself would have said had he been present, and would have put into his law if he had known. Hence the equitable is just, and better than one kind of justice – not better than absolute justice but better than the error that arises from the absoluteness of the statement. And this is the nature of the equitable, a correction of law where it is defective owing to its universality. In fact this is the reason why all things are not determined by law, that about some things it is impossible to lay down a law, so that a decree is needed. For when the thing is indefinite the rule also is indefinite, like the leaden rule used in making the Lesbian

moulding; the rule adapts itself to the shape of the stone and is not rigid, and so too the decree is adapted to the facts.

It is plain, then, what the equitable is, and that it is just and is better than one kind of justice. It is evident also from this who the equitable man is; the man who chooses and does such acts, and is no stickler for his rights in a bad sense but tends to take less than his share though he has the law oft his side, is equitable, and this state of character is equity, which is a sort of justice and not a different state of character.

11

Whether a man can treat himself unjustly or not, is evident from what has been said. For (a) one class of just acts are those acts in accordance with any virtue which are prescribed by the law; e.g. the law does not expressly permit suicide, and what it does not expressly permit it forbids. Again, when a man in violation of the law harms another (otherwise than in retaliation) voluntarily, he acts unjustly, and a voluntary agent is one who knows both the person he is affecting by his action and the instrument he is using; and he who through anger voluntarily stabs himself does this contrary to the right rule of life, and this the law does not allow; therefore he is acting unjustly. But towards whom? Surely towards the state, not towards himself. For he suffers voluntarily, but no one is voluntarily treated unjustly. This is also the reason why the state punishes; a certain loss of civil rights attaches to the man who destroys himself, on the ground that he is treating the state unjustly.

Further (b) in that sense of 'acting unjustly' in which the man who 'acts unjustly' is unjust only and not bad all round, it is not

possible to treat oneself unjustly (this is different from the former sense; the unjust man in one sense of the term is wicked in a particularized way just as the coward is, not in the sense of being wicked all round, so that his 'unjust act' does not manifest wickedness in general). For (i) that would imply the possibility of the same thing's having been subtracted from and added to the same thing at the same time; but this is impossible – the just and the unjust always involve more than one person. Further, (ii) unjust action is voluntary and done by choice, and takes the initiative (for the man who because he has suffered does the same in return is not thought to act unjustly); but if a man harms himself he suffers and does the same things at the same time. Further, (iii) if a man could treat himself unjustly, he could be voluntarily treated unjustly. Besides, (iv) no one acts unjustly without committing particular acts of injustice; but no one can commit adultery with his own wife or housebreaking on his own house or theft on his own property,

In general, the question 'can a man treat himself unjustly?' is solved also by the distinction we applied to the question 'can a man be voluntarily treated unjustly?'

(It is evident too that both are bad, being unjustly treated and acting unjustly; for the one means having less and the other having more than the intermediate amount, which plays the part here that the healthy does in the medical art, and that good condition does in the art of bodily training. But still acting unjustly is the worse, for it involves vice and is blameworthy – involves vice which is either of the complete and unqualified kind or almost so (we must admit the latter alternative, because not all voluntary unjust action implies injustice as a state of character), while being unjustly treated does not involve vice and injustice in oneself. In itself, then, being unjustly treated is less bad, but there is nothing to prevent its being incidentally a greater evil. But theory cares nothing for this; it calls pleurisy a

more serious mischief than a stumble; yet the latter may become incidentally the more serious, if the fall due to it leads to your being taken prisoner or put to death the enemy.)

Metaphorically and in virtue of a certain resemblance there is a justice, not indeed between a man and himself, but between certain parts of him; yet not every kind of justice but that of master and servant or that of husband and wife. For these are the ratios in which the part of the soul that has a rational principle stands to the irrational part; and it is with a view to these parts that people also think a man can be unjust to himself, viz. because these parts are liable to suffer something contrary to their respective desires; there is therefore thought to be a mutual justice between them as between ruler and ruled.

Let this be taken as our account of justice and the other, i.e. the other moral, virtues.

Book VI

1

Since we have previously said that one ought to choose that which is intermediate, not the excess nor the defect, and that the intermediate is determined by the dictates of the right rule, let us discuss the nature of these dictates. In all the states of character we have mentioned, as in all other matters, there is a mark to which the man who has the rule looks, and heightens

or relaxes his activity accordingly, and there is a standard which determines the mean states which we say are intermediate between excess and defect, being in accordance with the right rule. But such a statement, though true, is by no means clear; for not only here but in all other pursuits which are objects of knowledge it is indeed true to say that we must not exert ourselves nor relax our efforts too much nor too little, but to an intermediate extent and as the right rule dictates; but if a man had only this knowledge he would be none the wiser e.g. we should not know what sort of medicines to apply to our body if some one were to say 'all those which the medical art prescribes, and which agree with the practice of one who possesses the art'. Hence it is necessary with regard to the states of the soul also not only that this true statement should be made, but also that it should be determined what is the right rule and what is the standard that fixes it.

We divided the virtues of the soul and a said that some are virtues of character and others of intellect. Now we have discussed in detail the moral virtues; with regard to the others let us express our view as follows, beginning with some remarks about the soul. We said before that there are two parts of the soul – that which grasps a rule or rational principle, and the irrational; let us now draw a similar distinction within the part which grasps a rational principle. And let it be assumed that there are two parts which grasp a rational principle – one by which we contemplate the kind of things whose originative causes are invariable, and one by which we contemplate variable things; for where objects differ in kind the part of the soul answering to each of the two is different in kind, since it is in virtue of a certain likeness and kinship with their objects that they have the knowledge they have. Let one of these parts be called the scientific and the other the calculative; for to deliberate and to calculate are the same thing, but no one deliberates about the invariable. Therefore the calculative is one

part of the faculty which grasps a rational principle. We must, then, learn what is the best state of each of these two parts; for this is the virtue of each.

2

The virtue of a thing is relative to its proper work. Now there are three things in the soul which control action and truth – sensation, reason, desire.

Of these sensation originates no action; this is plain from the fact that the lower animals have sensation but no share in action.

What affirmation and negation are in thinking, pursuit and avoidance are in desire; so that since moral virtue is a state of character concerned with choice, and choice is deliberate desire, therefore both the reasoning must be true and the desire right, if the choice is to be good, and the latter must pursue just what the former asserts. Now this kind of intellect and of truth is practical; of the intellect which is contemplative, not practical nor productive, the good and the bad state are truth and falsity respectively (for this is the work of everything intellectual); while of the part which is practical and intellectual the good state is truth in agreement with right desire.

The origin of action – its efficient, not its final cause – is choice, and that of choice is desire and reasoning with a view to an end. This is why choice cannot exist either without reason and intellect or without a moral state; for good action and its opposite cannot exist without a combination of intellect and character. Intellect itself, however, moves nothing, but only the intellect which aims at an end and is practical; for this rules the

productive intellect, as well, since every one who makes makes for an end, and that which is made is not an end in the unqualified sense (but only an end in a particular relation, and the end of a particular operation) – only that which is done is that; for good action is an end, and desire aims at this. Hence choice is either desiderative reason or ratiocinative desire, and such an origin of action is a man. (It is to be noted that nothing that is past is an object of choice, e.g. no one chooses to have sacked Troy; for no one deliberates about the past, but about what is future and capable of being otherwise, while what is past is not capable of not having taken place; hence Agathon is right in saying

For this alone is lacking even to God,

To make undone things thathave once been done.)

The work of both the intellectual parts, then, is truth. Therefore the states that are most strictly those in respect of which each of these parts will reach truth are the virtues of the two parts.

3

Let us begin, then, from the beginning, and discuss these states once more. Let it be assumed that the states by virtue of which the soul possesses truth by way of affirmation or denial are five in number, i.e. art, scientific knowledge, practical wisdom, philosophic wisdom, intuitive reason; we do not include judgement and opinion because in these we may be mistaken.

Now what scientific knowledge is, if we are to speak exactly and not follow mere similarities, is plain from what follows. We all suppose that what we know is not even capable of being

otherwise; of things capable of being otherwise we do not know, when they have passed outside our observation, whether they exist or not. Therefore the object of scientific knowledge is of necessity. Therefore it is eternal; for things that are of necessity in the unqualified sense are all eternal; and things that are eternal are ungenerated and imperishable. Again, every science is thought to be capable of being taught, and its object of being learned. And all teaching starts from what is already known, as we maintain in the Analytics also; for it proceeds sometimes through induction and sometimes by syllogism. Now induction is the starting-point which knowledge even of the universal presupposes, while syllogism proceeds from universals. There are therefore starting-points from which syllogism proceeds, which are not reached by syllogism; it is therefore by induction that they are acquired. Scientific knowledge is, then, a state of capacity to demonstrate, and has the other limiting characteristics which we specify in the Analytics, for it is when a man believes in a certain way and the starting-points are known to him that he has scientific knowledge, since if they are not better known to him than the conclusion, he will have his knowledge only incidentally.

Let this, then, be taken as our account of scientific knowledge.

4

In the variable are included both things made and things done; making and acting are different (for their nature we treat even the discussions outside our school as reliable); so that the reasoned state of capacity to act is different from the reasoned state of capacity to make. Hence too they are not included one in the other; for neither is acting making nor is making acting.

Now since architecture is an art and is essentially a reasoned state of capacity to make, and there is neither any art that is not such a state nor any such state that is not an art, art is identical with a state of capacity to make, involving a true course of reasoning. All art is concerned with coming into being, i.e. with contriving and considering how something may come into being which is capable of either being or not being, and whose origin is in the maker and not in the thing made; for art is concerned neither with things that are, or come into being, by necessity, nor with things that do so in accordance with nature (since these have their origin in themselves). Making and acting being different, art must be a matter of making, not of acting. And in a sense chance and art are concerned with the same objects; as Agathon says, 'art loves chance and chance loves art'. Art, then, as has been is a state concerned with making, involving a true course of reasoning, and lack of art on the contrary is a state concerned with making, involving a false course of reasoning; both are concerned with the variable.

5

Regarding practical wisdom we shall get at the truth by considering who are the persons we credit with it. Now it is thought to be the mark of a man of practical wisdom to be able to deliberate well about what is good and expedient for himself, not in some particular respect, e.g. about what sorts of thing conduce to health or to strength, but about what sorts of thing conduce to the good life in general. This is shown by the fact that we credit men with practical wisdom in some particular respect when they have calculated well with a view to some good end which is one of those that are not the object of any art. It follows that in the general sense also the man who is

capable of deliberating has practical wisdom. Now no one deliberates about things that are invariable, nor about things that it is impossible for him to do. Therefore, since scientific knowledge involves demonstration, but there is no demonstration of things whose first principles are variable (for all such things might actually be otherwise), and since it is impossible to deliberate about things that are of necessity, practical wisdom cannot be scientific knowledge nor art; not science because that which can be done is capable of being otherwise, not art because action and making are different kinds of thing. The remaining alternative, then, is that it is a true and reasoned state of capacity to act with regard to the things that are good or bad for man. For while making has an end other than itself, action cannot; for good action itself is its end. It is for this reason that we think Pericles and men like him have practical wisdom, viz. because they can see what is good for themselves and what is good for men in general; we consider that those can do this who are good at managing households or states. (This is why we call temperance (sophrosune) by this name; we imply that it preserves one's practical wisdom (sozousa tan phronsin). Now what it preserves is a judgement of the kind we have described. For it is not any and every judgement that pleasant and painful objects destroy and pervert, e.g. the judgement that the triangle has or has not its angles equal to two right angles, but only judgements about what is to be done. For the originating causes of the things that are done consist in the end at which they are aimed; but the man who has been ruined by pleasure or pain forthwith fails to see any such originating cause – to see that for the sake of this or because of this he ought to choose and do whatever he chooses and does; for vice is destructive of the originating cause of action.) Practical wisdom, then, must be a reasoned and true state of capacity to act with regard to human goods. But further, while there is such a thing as excellence in art, there is no such

thing as excellence in practical wisdom; and in art he who errs willingly is preferable, but in practical wisdom, as in the virtues, he is the reverse. Plainly, then, practical wisdom is a virtue and not an art. There being two parts of the soul that can follow a course of reasoning, it must be the virtue of one of the two, i.e. of that part which forms opinions; for opinion is about the variable and so is practical wisdom. But yet it is not only a reasoned state; this is shown by the fact that a state of that sort may forgotten but practical wisdom cannot.

6

Scientific knowledge is judgement about things that are universal and necessary, and the conclusions of demonstration, and all scientific knowledge, follow from first principles (for scientific knowledge involves apprehension of a rational ground). This being so, the first principle from which what is scientifically known follows cannot be an object of scientific knowledge, of art, or of practical wisdom; for that which can be scientifically known can be demonstrated, and art and practical wisdom deal with things that are variable. Nor are these first principles the objects of philosophic wisdom, for it is a mark of the philosopher to have demonstration about some things. If, then, the states of mind by which we have truth and are never deceived about things invariable or even variable are scientific knowlededge, practical wisdom, philosophic wisdom, and intuitive reason, and it cannot be any of the three (i.e. practical wisdom, scientific knowledge, or philosophic wisdom), the remaining alternative is that it is intuitive reason that grasps the first principles.

7

Wisdom (1) in the arts we ascribe to their most finished exponents, e.g. to Phidias as a sculptor and to Polyclitus as a maker of portrait-statues, and here we mean nothing by wisdom except excellence in art; but (2) we think that some people are wise in general, not in some particular field or in any other limited respect, as Homer says in the Margites,

Him did the gods make neither a digger nor yet a ploughman

Nor wise in anything else. Therefore wisdom must plainly be the most finished of the forms of knowledge. It follows that the wise man must not only know what follows from the first principles, but must also possess truth about the first principles. Therefore wisdom must be intuitive reason combined with scientific knowledge – scientific knowledge of the highest objects which has received as it were its proper completion.

Of the highest objects, we say; for it would be strange to think that the art of politics, or practical wisdom, is the best knowledge, since man is not the best thing in the world. Now if what is healthy or good is different for men and for fishes, but what is white or straight is always the same, any one would say that what is wise is the same but what is practically wise is different; for it is to that which observes well the various matters concerning itself that one ascribes practical wisdom, and it is to this that one will entrust such matters. This is why we say that some even of the lower animals have practical wisdom, viz. those which are found to have a power of foresight with regard to their own life. It is evident also that philosophic wisdom and the art of politics cannot be the same; for if the state of mind concerned with a man's own interests is to be called philosophic wisdom, there will be many philosophic

wisdoms; there will not be one concerned with the good of all animals (any more than there is one art of medicine for all existing things), but a different philosophic wisdom about the good of each species.

But if the argument be that man is the best of the animals, this makes no difference; for there are other things much more divine in their nature even than man, e.g., most conspicuously, the bodies of which the heavens are framed. From what has been said it is plain, then, that philosophic wisdom is scientific knowledge, combined with intuitive reason, of the things that are highest by nature. This is why we say Anaxagoras, Thales, and men like them have philosophic but not practical wisdom, when we see them ignorant of what is to their own advantage, and why we say that they know things that are remarkable, admirable, difficult, and divine, but useless; viz. because it is not human goods that they seek.

Practical wisdom on the other hand is concerned with things human and things about which it is possible to deliberate; for we say this is above all the work of the man of practical wisdom, to deliberate well, but no one deliberates about things invariable, nor about things which have not an end, and that a good that can be brought about by action. The man who is without qualification good at deliberating is the man who is capable of aiming in accordance with calculation at the best for man of things attainable by action. Nor is practical wisdom concerned with universals only – it must also recognize the particulars; for it is practical, and practice is concerned with particulars. This is why some who do not know, and especially those who have experience, are more practical than others who know; for if a man knew that light meats are digestible and wholesome, but did not know which sorts of meat are light, he would not produce health, but the man who knows that chicken is wholesome is more likely to produce health.

Now practical wisdom is concerned with action; therefore one should have both forms of it, or the latter in preference to the former. But of practical as of philosophic wisdom there must be a controlling kind.

8

Political wisdom and practical wisdom are the same state of mind, but their essence is not the same. Of the wisdom concerned with the city, the practical wisdom which plays a controlling part is legislative wisdom, while that which is related to this as particulars to their universal is known by the general name 'political wisdom'; this has to do with action and deliberation, for a decree is a thing to be carried out in the form of an individual act. This is why the exponents of this art are alone said to 'take part in politics'; for these alone 'do things' as manual labourers 'do things'.

Practical wisdom also is identified especially with that form of it which is concerned with a man himself – with the individual; and this is known by the general name 'practical wisdom'; of the other kinds one is called household management, another legislation, the third politics, and of the latter one part is called deliberative and the other judicial. Now knowing what is good for oneself will be one kind of knowledge, but it is very different from the other kinds; and the man who knows and concerns himself with his own interests is thought to have practical wisdom, while politicians are thought to be busybodies; hence the word of Euripides,

But how could I be wise, who might at ease,

Numbered among the army's multitude,

Have had an equal share?

For those who aim too high and do too much. Those who think thus seek their own good, and consider that one ought to do so. From this opinion, then, has come the view that such men have practical wisdom; yet perhaps one's own good cannot exist without household management, nor without a form of government. Further, how one should order one's own affairs is not clear and needs inquiry.

What has been said is confirmed by the fact that while young men become geometricians and mathematicians and wise in matters like these, it is thought that a young man of practical wisdom cannot be found. The cause is that such wisdom is concerned not only with universals but with particulars, which become familiar from experience, but a young man has no experience, for it is length of time that gives experience; indeed one might ask this question too, why a boy may become a mathematician, but not a philosopher or a physicist. It is because the objects of mathematics exist by abstraction, while the first principles of these other subjects come from experience, and because young men have no conviction about the latter but merely use the proper language, while the essence of mathematical objects is plain enough to them?

Further, error in deliberation may be either about the universal or about the particular; we may fall to know either that all water that weighs heavy is bad, or that this particular water weighs heavy.

That practical wisdom is not scientific knowledge is evident; for it is, as has been said, concerned with the ultimate particular fact, since the thing to be done is of this nature. It is opposed, then, to intuitive reason; for intuitive reason is of the limiting premisses, for which no reason can be given, while practical wisdom is concerned with the ultimate particular, which is the

object not of scientific knowledge but of perception – not the perception of qualities peculiar to one sense but a perception akin to that by which we perceive that the particular figure before us is a triangle; for in that direction as well as in that of the major premiss there will be a limit. But this is rather perception than practical wisdom, though it is another kind of perception than that of the qualities peculiar to each sense.

9

There is a difference between inquiry and deliberation; for deliberation is inquiry into a particular kind of thing. We must grasp the nature of excellence in deliberation as well whether it is a form of scientific knowledge, or opinion, or skill in conjecture, or some other kind of thing. Scientific knowledge it is not; for men do not inquire about the things they know about, but good deliberation is a kind of deliberation, and he who deliberates inquires and calculates. Nor is it skill in conjecture; for this both involves no reasoning and is something that is quick in its operation, while men deliberate a long time, and they say that one should carry out quickly the conclusions of one's deliberation, but should deliberate slowly. Again, readiness of mind is different from excellence in deliberation; it is a sort of skill in conjecture. Nor again is excellence in deliberation opinion of any sort. But since the man who deliberates badly makes a mistake, while he who deliberates well does so correctly, excellence in deliberation is clearly a kind of correctness, but neither of knowledge nor of opinion; for there is no such thing as correctness of knowledge (since there is no such thing as error of knowledge), and correctness of opinion is truth; and at the same time everything that is an object of opinion is already determined. But again excellence in

deliberation involves reasoning. The remaining alternative, then, is that it is correctness of thinking; for this is not yet assertion, since, while even opinion is not inquiry but has reached the stage of assertion, the man who is deliberating, whether he does so well or ill, is searching for something and calculating.

But excellence in deliberation is a certain correctness of deliberation; hence we must first inquire what deliberation is and what it is about. And, there being more than one kind of correctness, plainly excellence in deliberation is not any and every kind; for (1) the incontinent man and the bad man, if he is clever, will reach as a result of his calculation what he sets before himself, so that he will have deliberated correctly, but he will have got for himself a great evil. Now to have deliberated well is thought to be a good thing; for it is this kind of correctness of deliberation that is excellence in deliberation, viz. that which tends to attain what is good. But (2) it is possible to attain even good by a false syllogism, and to attain what one ought to do but not by the right means, the middle term being false; so that this too is not yet excellence in deliberation this state in virtue of which one attains what one ought but not by the right means. Again (3) it is possible to attain it by long deliberation while another man attains it quickly. Therefore in the former case we have not yet got excellence in deliberation, which is rightness with regard to the expedient – rightness in respect both of the end, the manner, and the time. (4) Further it is possible to have deliberated well either in the unqualified sense or with reference to a particular end. Excellence in deliberation in the unqualified sense, then, is that which succeeds with reference to what is the end in the unqualified sense, and excellence in deliberation in a particular sense is that which succeeds relatively to a particular end. If, then, it is characteristic of men of practical wisdom to have deliberated well, excellence in deliberation will be correctness with regard

to what conduces to the end of which practical wisdom is the true apprehension.

10

Understanding, also, and goodness of understanding, in virtue of which men are said to be men of understanding or of good understanding, are neither entirely the same as opinion or scientific knowledge (for at that rate all men would have been men of understanding), nor are they one of the particular sciences, such as medicine, the science of things connected with health, or geometry, the science of spatial magnitudes. For understanding is neither about things that are always and are unchangeable, nor about any and every one of the things that come into being, but about things which may become subjects of questioning and deliberation. Hence it is about the same objects as practical wisdom; but understanding and practical wisdom are not the same. For practical wisdom issues commands, since its end is what ought to be done or not to be done; but understanding only judges. (Understanding is identical with goodness of understanding, men of understanding with men of good understanding.) Now understanding is neither the having nor the acquiring of practical wisdom; but as learning is called understanding when it means the exercise of the faculty of knowledge, so 'understanding' is applicable to the exercise of the faculty of opinion for the purpose of judging of what some one else says about matters with which practical wisdom is concerned – and of judging soundly; for 'well' and 'soundly' are the same thing. And from this has come the use of the name 'understanding' in virtue of which men are said to be 'of good understanding', viz.

from the application of the word to the grasping of scientific truth; for we often call such grasping understanding.

11

What is called judgement, in virtue of which men are said to 'be sympathetic judges' and to 'have judgement', is the right discrimination of the equitable. This is shown by the fact that we say the equitable man is above all others a man of sympathetic judgement, and identify equity with sympathetic judgement about certain facts. And sympathetic judgement is judgement which discriminates what is equitable and does so correctly; and correct judgement is that which judges what is true.

Now all the states we have considered converge, as might be expected, to the same point; for when we speak of judgement and understanding and practical wisdom and intuitive reason we credit the same people with possessing judgement and having reached years of reason and with having practical wisdom and understanding. For all these faculties deal with ultimates, i.e. with particulars; and being a man of understanding and of good or sympathetic judgement consists in being able judge about the things with which practical wisdom is concerned; for the equities are common to all good men in relation to other men. Now all things which have to be done are included among particulars or ultimates; for not only must the man of practical wisdom know particular facts, but understanding and judgement are also concerned with things to be done, and these are ultimates. And intuitive reason is concerned with the ultimates in both directions; for both the first terms and the last are objects of intuitive reason and not of

argument, and the intuitive reason which is presupposed by demonstrations grasps the unchangeable and first terms, while the intuitive reason involved in practical reasonings grasps the last and variable fact, i.e. the minor premiss. For these variable facts are the starting-points for the apprehension of the end, since the universals are reached from the particulars; of these therefore we must have perception, and this perception is intuitive reason.

This is why these states are thought to be natural endowments – why, while no one is thought to be a philosopher by nature, people are thought to have by nature judgement, understanding, and intuitive reason. This is shown by the fact that we think our powers correspond to our time of life, and that a particular age brings with it intuitive reason and judgement; this implies that nature is the cause. (Hence intuitive reason is both beginning and end; for demonstrations are from these and about these.) Therefore we ought to attend to the undemonstrated sayings and opinions of experienced and older people or of people of practical wisdom not less than to demonstrations; for because experience has given them an eye they see aright.

We have stated, then, what practical and philosophic wisdom are, and with what each of them is concerned, and we have said that each is the virtue of a different part of the soul.

12

Difficulties might be raised as to the utility of these qualities of mind. For (1) philosophic wisdom will contemplate none of the things that will make a man happy (for it is not concerned with any coming into being), and though practical wisdom has this

merit, for what purpose do we need it? Practical wisdom is the quality of mind concerned with things just and noble and good for man, but these are the things which it is the mark of a good man to do, and we are none the more able to act for knowing them if the virtues are states of character, just as we are none the better able to act for knowing the things that are healthy and sound, in the sense not of producing but of issuing from the state of health; for we are none the more able to act for having the art of medicine or of gymnastics. But (2) if we are to say that a man should have practical wisdom not for the sake of knowing moral truths but for the sake of becoming good, practical wisdom will be of no use to those who are good; again it is of no use to those who have not virtue; for it will make no difference whether they have practical wisdom themselves or obey others who have it, and it would be enough for us to do what we do in the case of health; though we wish to become healthy, yet we do not learn the art of medicine. (3) Besides this, it would be thought strange if practical wisdom, being inferior to philosophic wisdom, is to be put in authority over it, as seems to be implied by the fact that the art which produces anything rules and issues commands about that thing.

These, then, are the questions we must discuss; so far we have only stated the difficulties.

(1) Now first let us say that in themselves these states must be worthy of choice because they are the virtues of the two parts of the soul respectively, even if neither of them produce anything.

(2) Secondly, they do produce something, not as the art of medicine produces health, however, but as health produces health; so does philosophic wisdom produce happiness; for, being a part of virtue entire, by being possessed and by actualizing itself it makes a man happy.

(3) Again, the work of man is achieved only in accordance with practical wisdom as well as with moral virtue; for virtue makes us aim at the right mark, and practical wisdom makes us take the right means. (Of the fourth part of the soul – the nutritive – there is no such virtue; for there is nothing which it is in its power to do or not to do.)

(4) With regard to our being none the more able to do because of our practical wisdom what is noble and just, let us begin a little further back, starting with the following principle. As we say that some people who do just acts are not necessarily just, i.e. those who do the acts ordained by the laws either unwillingly or owing to ignorance or for some other reason and not for the sake of the acts themselves (though, to be sure, they do what they should and all the things that the good man ought), so is it, it seems, that in order to be good one must be in a certain state when one does the several acts, i.e. one must do them as a result of choice and for the sake of the acts themselves. Now virtue makes the choice right, but the question of the things which should naturally be done to carry out our choice belongs not to virtue but to another faculty. We must devote our attention to these matters and give a clearer statement about them. There is a faculty which is called cleverness; and this is such as to be able to do the things that tend towards the mark we have set before ourselves, and to hit it. Now if the mark be noble, the cleverness is laudable, but if the mark be bad, the cleverness is mere smartness; hence we call even men of practical wisdom clever or smart. Practical wisdom is not the faculty, but it does not exist without this faculty. And this eye of the soul acquires its formed state not without the aid of virtue, as has been said and is plain; for the syllogisms which deal with acts to be done are things which involve a starting-point, viz. 'since the end, i.e. what is best, is of such and such a nature', whatever it may be (let it for the sake of argument be what we please); and this is not evident except to the good man; for

wickedness perverts us and causes us to be deceived about the starting-points of action. Therefore it is evident that it is impossible to be practically wise without being good.

13

We must therefore consider virtue also once more; for virtue too is similarly related; as practical wisdom is to cleverness – not the same, but like it – so is natural virtue to virtue in the strict sense. For all men think that each type of character belongs to its possessors in some sense by nature; for from the very moment of birth we are just or fitted for selfcontrol or brave or have the other moral qualities; but yet we seek something else as that which is good in the strict sense – we seek for the presence of such qualities in another way. For both children and brutes have the natural dispositions to these qualities, but without reason these are evidently hurtful. Only we seem to see this much, that, while one may be led astray by them, as a strong body which moves without sight may stumble badly because of its lack of sight, still, if a man once acquires reason, that makes a difference in action; and his state, while still like what it was, will then be virtue in the strict sense. Therefore, as in the part of us which forms opinions there are two types, cleverness and practical wisdom, so too in the moral part there are two types, natural virtue and virtue in the strict sense, and of these the latter involves practical wisdom. This is why some say that all the virtues are forms of practical wisdom, and why Socrates in one respect was on the right track while in another he went astray; in thinking that all the virtues were forms of practical wisdom he was wrong, but in saying they implied practical wisdom he was right. This is confirmed by the fact that even now all men, when they define virtue, after naming the

state of character and its objects add 'that (state) which is in accordance with the right rule'; now the right rule is that which is in accordance with practical wisdom. All men, then, seem somehow to divine that this kind of state is virtue, viz. that which is in accordance with practical wisdom. But we must go a little further. For it is not merely the state in accordance with the right rule, but the state that implies the presence of the right rule, that is virtue; and practical wisdom is a right rule about such matters. Socrates, then, thought the virtues were rules or rational principles (for he thought they were, all of them, forms of scientific knowledge), while we think they involve a rational principle.

It is clear, then, from what has been said, that it is not possible to be good in the strict sense without practical wisdom, nor practically wise without moral virtue. But in this way we may also refute the dialectical argument whereby it might be contended that the virtues exist in separation from each other; the same man, it might be said, is not best equipped by nature for all the virtues, so that he will have already acquired one when he has not yet acquired another. This is possible in respect of the natural virtues, but not in respect of those in respect of which a man is called without qualification good; for with the presence of the one quality, practical wisdom, will be given all the virtues. And it is plain that, even if it were of no practical value, we should have needed it because it is the virtue of the part of us in question; plain too that the choice will not be right without practical wisdom any more than without virtue; for the one deter, mines the end and the other makes us do the things that lead to the end.

But again it is not supreme over philosophic wisdom, i.e. over the superior part of us, any more than the art of medicine is over health; for it does not use it but provides for its coming into being; it issues orders, then, for its sake, but not to it.

Further, to maintain its supremacy would be like saying that the art of politics rules the gods because it issues orders about all the affairs of the state.

Book VII

1

Let us now make a fresh beginning and point out that of moral states to be avoided there are three kinds – vice, incontinence, brutishness. The contraries of two of these are evident, – one we call virtue, the other continence; to brutishness it would be most fitting to oppose superhuman virtue, a heroic and divine kind of virtue, as Homer has represented Priam saying of Hector that he was very good,

For he seemed not, he,

The child of a mortal man, but as one that of God's seed came.

Therefore if, as they say, men become gods by excess of virtue, of this kind must evidently be the state opposed to the brutish state; for as a brute has no vice or virtue, so neither has a god; his state is higher than virtue, and that of a brute is a different kind of state from vice.

Now, since it is rarely that a godlike man is found – to use the epithet of the Spartans, who when they admire any one highly call him a 'godlike man' – so too the brutish type is rarely found

among men; it is found chiefly among barbarians, but some brutish qualities are also produced by disease or deformity; and we also call by this evil name those men who go beyond all ordinary standards by reason of vice. Of this kind of disposition, however, we must later make some mention, while we have discussed vice before we must now discuss incontinence and softness (or effeminacy), and continence and endurance; for we must treat each of the two neither as identical with virtue or wickedness, nor as a different genus. We must, as in all other cases, set the observed facts before us and, after first discussing the difficulties, go on to prove, if possible, the truth of all the common opinions about these affections of the mind, or, failing this, of the greater number and the most authoritative; for if we both refute the objections and leave the common opinions undisturbed, we shall have proved the case sufficiently.

Now (1) both continence and endurance are thought to be included among things good and praiseworthy, and both incontinence and soft, ness among things bad and blameworthy; and the same man is thought to be continent and ready to abide by the result of his calculations, or incontinent and ready to abandon them. And (2) the incontinent man, knowing that what he does is bad, does it as a result of passion, while the continent man, knowing that his appetites are bad, refuses on account of his rational principle to follow them (3) The temperate man all men call continent and disposed to endurance, while the continent man some maintain to be always temperate but others do not; and some call the self-indulgent man incontinent and the incontinent man selfindulgent indiscriminately, while others distinguish them. (4) The man of practical wisdom, they sometimes say, cannot be incontinent, while sometimes they say that some who are practically wise and clever are incontinent. Again (5) men are said to be incontinent even with respect to anger, honour, and gain. – These, then, are the things that are said.

2

Now we may ask (1) how a man who judges rightly can behave incontinently. That he should behave so when he has knowledge, some say is impossible; for it would be strange – so Socrates thought – if when knowledge was in a man something else could master it and drag it about like a slave. For Socrates was entirely opposed to the view in question, holding that there is no such thing as incontinence; no one, he said, when he judges acts against what he judges best-people act so only by reason of ignorance. Now this view plainly contradicts the observed facts, and we must inquire about what happens to such a man; if he acts by reason of ignorance, what is the manner of his ignorance? For that the man who behaves incontinently does not, before he gets into this state, think he ought to act so, is evident. But there are some who concede certain of Socrates' contentions but not others; that nothing is stronger than knowledge they admit, but not that on one acts contrary to what has seemed to him the better course, and therefore they say that the incontinent man has not knowledge when he is mastered by his pleasures, but opinion. But if it is opinion and not knowledge, if it is not a strong conviction that resists but a weak one, as in men who hesitate, we sympathize with their failure to stand by such convictions against strong appetites; but we do not sympathize with wickedness, nor with any of the other blameworthy states. Is it then practical wisdom whose resistance is mastered? That is the strongest of all states. But this is absurd; the same man will be at once practically wise and incontinent, but no one would say that it is the part of a practically wise man to do willingly the basest acts. Besides, it has been shown before that the man of practical wisdom is one

who will act (for he is a man concerned with the individual facts) and who has the other virtues.

(2) Further, if continence involves having strong and bad appetites, the temperate man will not be continent nor the continent man temperate; for a temperate man will have neither excessive nor bad appetites. But the continent man must; for if the appetites are good, the state of character that restrains us from following them is bad, so that not all continence will be good; while if they are weak and not bad, there is nothing admirable in resisting them, and if they are weak and bad, there is nothing great in resisting these either.

(3) Further, if continence makes a man ready to stand by any and every opinion, it is bad, i.e. if it makes him stand even by a false opinion; and if incontinence makes a man apt to abandon any and every opinion, there will be a good incontinence, of which Sophocles' Neoptolemus in the Philoctetes will be an instance; for he is to be praised for not standing by what Odysseus persuaded him to do, because he is pained at telling a lie.

(4) Further, the sophistic argument presents a difficulty; the syllogism arising from men's wish to expose paradoxical results arising from an opponent's view, in order that they may be admired when they succeed, is one that puts us in a difficulty (for thought is bound fast when it will not rest because the conclusion does not satisfy it, and cannot advance because it cannot refute the argument). There is an argument from which it follows that folly coupled with incontinence is virtue; for a man does the opposite of what he judges, owing to incontinence, but judges what is good to be evil and something that he should not do, and consequence he will do what is good and not what is evil.

(5) Further, he who on conviction does and pursues and chooses what is pleasant would be thought to be better than one who does so as a result not of calculation but of incontinence; for he is easier to cure since he may be persuaded to change his mind. But to the incontinent man may be applied the proverb 'when water chokes, what is one to wash it down with?' If he had been persuaded of the rightness of what he does, he would have desisted when he was persuaded to change his mind; but now he acts in spite of his being persuaded of something quite different.

(6) Further, if incontinence and continence are concerned with any and every kind of object, who is it that is incontinent in the unqualified sense? No one has all the forms of incontinence, but we say some people are incontinent without qualification.

3

Of some such kind are the difficulties that arise; some of these points must be refuted and the others left in possession of the field; for the solution of the difficulty is the discovery of the truth. (1) We must consider first, then, whether incontinent people act knowingly or not, and in what sense knowingly; then (2) with what sorts of object the incontinent and the continent man may be said to be concerned (i.e. whether with any and every pleasure and pain or with certain determinate kinds), and whether the continent man and the man of endurance are the same or different; and similarly with regard to the other matters germane to this inquiry. The starting-point of our investigation is (a) the question whether the continent man and the incontinent are differentiated by their objects or by their attitude, i.e. whether the incontinent man is incontinent simply

by being concerned with such and such objects, or, instead, by his attitude, or, instead of that, by both these things; (b) the second question is whether incontinence and continence are concerned with any and every object or not. The man who is incontinent in the unqualified sense is neither concerned with any and every object, but with precisely those with which the self-indulgent man is concerned, nor is he characterized by being simply related to these (for then his state would be the same as self-indulgence), but by being related to them in a certain way. For the one is led on in accordance with his own choice, thinking that he ought always to pursue the present pleasure; while the other does not think so, but yet pursues it.

(1) As for the suggestion that it is true opinion and not knowledge against which we act incontinently, that makes no difference to the argument; for some people when in a state of opinion do not hesitate, but think they know exactly. If, then, the notion is that owing to their weak conviction those who have opinion are more likely to act against their judgement than those who know, we answer that there need be no difference between knowledge and opinion in this respect; for some men are no less convinced of what they think than others of what they know; as is shown by the of Heraclitus. But (a), since we use the word 'know' in two senses (for both the man who has knowledge but is not using it and he who is using it are said to know), it will make a difference whether, when a man does what he should not, he has the knowledge but is not exercising it, or is exercising it; for the latter seems strange, but not the former.

(b) Further, since there are two kinds of premisses, there is nothing to prevent a man's having both premisses and acting against his knowledge, provided that he is using only the universal premiss and not the particular; for it is particular acts that have to be done. And there are also two kinds of universal

term; one is predicable of the agent, the other of the object; e.g. ‘dry food is good for every man’, and ‘I am a man’, or ‘such and such food is dry’; but whether ‘this food is such and such’, of this the incontinent man either has not or is not exercising the knowledge. There will, then, be, firstly, an enormous difference between these manners of knowing, so that to know in one way when we act incontinently would not seem anything strange, while to know in the other way would be extraordinary.

And further (c) the possession of knowledge in another sense than those just named is something that happens to men; for within the case of having knowledge but not using it we see a difference of state, admitting of the possibility of having knowledge in a sense and yet not having it, as in the instance of a man asleep, mad, or drunk. But now this is just the condition of men under the influence of passions; for outbursts of anger and sexual appetites and some other such passions, it is evident, actually alter our bodily condition, and in some men even produce fits of madness. It is plain, then, that incontinent people must be said to be in a similar condition to men asleep, mad, or drunk. The fact that men use the language that flows from knowledge proves nothing; for even men under the influence of these passions utter scientific proofs and verses of Empedocles, and those who have just begun to learn a science can string together its phrases, but do not yet know it; for it has to become part of themselves, and that takes time; so that we must suppose that the use of language by men in an incontinent state means no more than its utterance by actors on the stage. (d) Again, we may also view the cause as follows with reference to the facts of human nature. The one opinion is universal, the other is concerned with the particular facts, and here we come to something within the sphere of perception; when a single opinion results from the two, the soul must in one type of case affirm the conclusion, while in the case of opinions concerned with production it must immediately act

(e.g. if ‘everything sweet ought to be tasted’, and ‘this is sweet’, in the sense of being one of the particular sweet things, the man who can act and is not prevented must at the same time actually act accordingly). When, then, the universal opinion is present in us forbidding us to taste, and there is also the opinion that ‘everything sweet is pleasant’, and that ‘this is sweet’ (now this is the opinion that is active), and when appetite happens to be present in us, the one opinion bids us avoid the object, but appetite leads us towards it (for it can move each of our bodily parts); so that it turns out that a man behaves incontinently under the influence (in a sense) of a rule and an opinion, and of one not contrary in itself, but only incidentally – for the appetite is contrary, not the opinion – to the right rule. It also follows that this is the reason why the lower animals are not incontinent, viz. because they have no universal judgement but only imagination and memory of particulars.

The explanation of how the ignorance is dissolved and the incontinent man regains his knowledge, is the same as in the case of the man drunk or asleep and is not peculiar to this condition; we must go to the students of natural science for it. Now, the last premiss both being an opinion about a perceptible object, and being what determines our actions this a man either has not when he is in the state of passion, or has it in the sense in which having knowledge did not mean knowing but only talking, as a drunken man may utter the verses of Empedocles. And because the last term is not universal nor equally an object of scientific knowledge with the universal term, the position that Socrates sought to establish actually seems to result; for it is not in the presence of what is thought to be knowledge proper that the affection of incontinence arises (nor is it this that is ‘dragged about’ as a result of the state of passion), but in that of perceptual knowledge.

This must suffice as our answer to the question of action with and without knowledge, and how it is possible to behave incontinently with knowledge.

4

(2) We must next discuss whether there is any one who is incontinent without qualification, or all men who are incontinent are so in a particular sense, and if there is, with what sort of objects he is concerned. That both continent persons and persons of endurance, and incontinent and soft persons, are concerned with pleasures and pains, is evident.

Now of the things that produce pleasure some are necessary, while others are worthy of choice in themselves but admit of excess, the bodily causes of pleasure being necessary (by such I mean both those concerned with food and those concerned with sexual intercourse, i.e. the bodily matters with which we defined self-indulgence and temperance as being concerned), while the others are not necessary but worthy of choice in themselves (e.g. victory, honour, wealth, and good and pleasant things of this sort). This being so, (a) those who go to excess with reference to the latter, contrary to the right rule which is in themselves, are not called incontinent simply, but incontinent with the qualification 'in respect of money, gain, honour, or anger', – not simply incontinent, on the ground that they are different from incontinent people and are called incontinent by reason of a resemblance. (Compare the case of Anthropos (Man), who won a contest at the Olympic games; in his case the general definition of man differed little from the definition peculiar to him, but yet it was different.) This is shown by the fact that incontinence either without qualification or in respect

of some particular bodily pleasure is blamed not only as a fault but as a kind of vice, while none of the people who are incontinent in these other respects is so blamed.

But (b) of the people who are incontinent with respect to bodily enjoyments, with which we say the temperate and the self-indulgent man are concerned, he who pursues the excesses of things pleasant – and shuns those of things painful, of hunger and thirst and heat and cold and all the objects of touch and taste – not by choice but contrary to his choice and his judgement, is called incontinent, not with the qualification 'in respect of this or that', e.g. of anger, but just simply. This is confirmed by the fact that men are called 'soft' with regard to these pleasures, but not with regard to any of the others. And for this reason we group together the incontinent and the self-indulgent, the continent and the temperate man – but not any of these other types – because they are concerned somehow with the same pleasures and pains; but though these are concerned with the same objects, they are not similarly related to them, but some of them make a deliberate choice while the others do not.

This is why we should describe as self-indulgent rather the man who without appetite or with but a slight appetite pursues the excesses of pleasure and avoids moderate pains, than the man who does so because of his strong appetites; for what would the former do, if he had in addition a vigorous appetite, and a violent pain at the lack of the 'necessary' objects?

Now of appetites and pleasures some belong to the class of things generically noble and good – for some pleasant things are by nature worthy of choice, while others are contrary to these, and others are intermediate, to adopt our previous distinction – e.g. wealth, gain, victory, honour. And with reference to all objects whether of this or of the intermediate kind men are not

blamed for being affected by them, for desiring and loving them, but for doing so in a certain way, i.e. for going to excess. (This is why all those who contrary to the rule either are mastered by or pursue one of the objects which are naturally noble and good, e.g. those who busy themselves more than they ought about honour or about children and parents, (are not wicked); for these too are good, and those who busy themselves about them are praised; but yet there is an excess even in them – if like Niobe one were to fight even against the gods, or were to be as much devoted to one's father as Satyrus nicknamed 'the filial', who was thought to be very silly on this point.) There is no wickedness, then, with regard to these objects, for the reason named, viz. because each of them is by nature a thing worthy of choice for its own sake; yet excesses in respect of them are bad and to be avoided. Similarly there is no incontinence with regard to them; for incontinence is not only to be avoided but is also a thing worthy of blame; but owing to a similarity in the state of feeling people apply the name incontinence, adding in each case what it is in respect of, as we may describe as a bad doctor or a bad actor one whom we should not call bad, simply. As, then, in this case we do not apply the term without qualification because each of these conditions is no shadness but only analogous to it, so it is clear that in the other case also that alone must be taken to be incontinence and continence which is concerned with the same objects as temperance and self-indulgence, but we apply the term to anger by virtue of a resemblance; and this is why we say with a qualification 'incontinent in respect of anger' as we say 'incontinent in respect of honour, or of gain'.

5

(1) Some things are pleasant by nature, and of these (a) some are so without qualification, and (b) others are so with reference to particular classes either of animals or of men; while (2) others are not pleasant by nature, but (a) some of them become so by reason of injuries to the system, and (b) others by reason of acquired habits, and (c) others by reason of originally bad natures. This being so, it is possible with regard to each of the latter kinds to discover similar states of character to those recognized with regard to the former; I mean (A) the brutish states, as in the case of the female who, they say, rips open pregnant women and devours the infants, or of the things in which some of the tribes about the Black Sea that have gone savage are said to delight – in raw meat or in human flesh, or in lending their children to one another to feast upon – or of the story told of Phalaris.

These states are brutish, but (B) others arise as a result of disease (or, in some cases, of madness, as with the man who sacrificed and ate his mother, or with the slave who ate the liver of his fellow), and others are morbid states (C) resulting from custom, e.g. the habit of plucking out the hair or of gnawing the nails, or even coals or earth, and in addition to these paederasty; for these arise in some by nature and in others, as in those who have been the victims of lust from childhood, from habit.

Now those in whom nature is the cause of such a state no one would call incontinent, any more than one would apply the epithet to women because of the passive part they play in copulation; nor would one apply it to those who are in a morbid condition as a result of habit. To have these various types of habit is beyond the limits of vice, as brutishness is too; for a man who has them to master or be mastered by them is not

simple (continence or) incontinence but that which is so by analogy, as the man who is in this condition in respect of fits of anger is to be called incontinent in respect of that feeling but not incontinent simply. For every excessive state whether of folly, of cowardice, of self-indulgence, or of bad temper, is either brutish or morbid; the man who is by nature apt to fear everything, even the squeak of a mouse, is cowardly with a brutish cowardice, while the man who feared a weasel did so in consequence of disease; and of foolish people those who by nature are thoughtless and live by their senses alone are brutish, like some races of the distant barbarians, while those who are so as a result of disease (e.g. of epilepsy) or of madness are morbid. Of these characteristics it is possible to have some only at times, and not to be mastered by them. e.g. Phalaris may have restrained a desire to eat the flesh of a child or an appetite for unnatural sexual pleasure; but it is also possible to be mastered, not merely to have the feelings. Thus, as the wickedness which is on the human level is called wickedness simply, while that which is not is called wickedness not simply but with the qualification 'brutish' or 'morbid', in the same way it is plain that some incontinence is brutish and some morbid, while only that which corresponds to human self-indulgence is incontinence simply.

That incontinence and continence, then, are concerned only with the same objects as selfindulgence and temperance and that what is concerned with other objects is a type distinct from incontinence, and called incontinence by a metaphor and not simply, is plain.

6

That incontinence in respect of anger is less disgraceful than that in respect of the appetites is what we will now proceed to see. (1) Anger seems to listen to argument to some extent, but to mishear it, as do hasty servants who run out before they have heard the whole of what one says, and then muddle the order, or as dogs bark if there is but a knock at the door, before looking to see if it is a friend; so anger by reason of the warmth and hastiness of its nature, though it hears, does not hear an order, and springs to take revenge. For argument or imagination informs us that we have been insulted or slighted, and anger, reasoning as it were that anything like this must be fought against, boils up straightway; while appetite, if argument or perception merely says that an object is pleasant, springs to the enjoyment of it. Therefore anger obeys the argument in a sense, but appetite does not. It is therefore more disgraceful; for the man who is incontinent in respect of anger is in a sense conquered by argument, while the other is conquered by appetite and not by argument.

(2) Further, we pardon people more easily for following natural desires, since we pardon them more easily for following such appetites as are common to all men, and in so far as they are common; now anger and bad temper are more natural than the appetites for excess, i.e. for unnecessary objects. Take for instance the man who defended himself on the charge of striking his father by saying ‘yes, but he struck his father, and he struck his, and’ (pointing to his child) ‘this boy will strike me when he is a man; it runs in the family’; or the man who when he was being dragged along by his son bade him stop at the doorway, since he himself had dragged his father only as far as that.

(2) Further, those who are more given to plotting against others are more criminal. Now a passionate man is not given to plotting, nor is anger itself – it is open; but the nature of appetite is illustrated by what the poets call Aphrodite, 'guile-weaving daughter of Cyprus', and by Homer's words about her 'embroidered girdle':

And the whisper of wooing is there,

Whose subtlety stealeth the wits of the wise, how prudent soe'er. Therefore if this form of incontinence is more criminal and disgraceful than that in respect of anger, it is both incontinence without qualification and in a sense vice.

(4) Further, no one commits wanton outrage with a feeling of pain, but every one who acts in anger acts with pain, while the man who commits outrage acts with pleasure. If, then, those acts at which it is most just to be angry are more criminal than others, the incontinence which is due to appetite is the more criminal; for there is no wanton outrage involved in anger.

Plainly, then, the incontinence concerned with appetite is more disgraceful than that concerned with anger, and continence and incontinence are concerned with bodily appetites and pleasures; but we must grasp the differences among the latter themselves. For, as has been said at the beginning, some are human and natural both in kind and in magnitude, others are brutish, and others are due to organic injuries and diseases. Only with the first of these are temperance and self-indulgence concerned; this is why we call the lower animals neither temperate nor self-indulgent except by a metaphor, and only if some one race of animals exceeds another as a whole in wantonness, destructiveness, and omnivorous greed; these have no power of choice or calculation, but they are departures from the natural norm, as, among men, madmen are. Now brutishness is a less evil than vice, though more alarming; for it

is not that the better part has been perverted, as in man, – they have no better part. Thus it is like comparing a lifeless thing with a living in respect of badness; for the badness of that which has no originative source of movement is always less hurtful, and reason is an originative source. Thus it is like comparing injustice in the abstract with an unjust man. Each is in some sense worse; for a bad man will do ten thousand times as much evil as a brute.

7

With regard to the pleasures and pains and appetites and aversions arising through touch and taste, to which both self-indulgence and temperance were formerly narrowed down, it possible to be in such a state as to be defeated even by those of them which most people master, or to master even those by which most people are defeated; among these possibilities, those relating to pleasures are incontinence and continence, those relating to pains softness and endurance. The state of most people is intermediate, even if they lean more towards the worse states.

Now, since some pleasures are necessary while others are not, and are necessary up to a point while the excesses of them are not, nor the deficiencies, and this is equally true of appetites and pains, the man who pursues the excesses of things pleasant, or pursues to excess necessary objects, and does so by choice, for their own sake and not at all for the sake of any result distinct from them, is self-indulgent; for such a man is of necessity unlikely to repent, and therefore incurable, since a man who cannot repent cannot be cured. The man who is deficient in his pursuit of them is the opposite of self-indulgent;

the man who is intermediate is temperate. Similarly, there is the man who avoids bodily pains not because he is defeated by them but by choice. (Of those who do not choose such acts, one kind of man is led to them as a result of the pleasure involved, another because he avoids the pain arising from the appetite, so that these types differ from one another. Now any one would think worse of a man with no appetite or with weak appetite were he to do something disgraceful, than if he did it under the influence of powerful appetite, and worse of him if he struck a blow not in anger than if he did it in anger; for what would he have done if he had been strongly affected? This is why the self-indulgent man is worse than the incontinent.) of the states named, then, the latter is rather a kind of softness; the former is self-indulgence. While to the incontinent man is opposed the continent, to the soft is opposed the man of endurance; for endurance consists in resisting, while continence consists in conquering, and resisting and conquering are different, as not being beaten is different from winning; this is why continence is also more worthy of choice than endurance. Now the man who is defective in respect of resistance to the things which most men both resist and resist successfully is soft and effeminate; for effeminacy too is a kind of softness; such a man trails his cloak to avoid the pain of lifting it, and plays the invalid without thinking himself wretched, though the man he imitates is a wretched man.

The case is similar with regard to continence and incontinence. For if a man is defeated by violent and excessive pleasures or pains, there is nothing wonderful in that; indeed we are ready to pardon him if he has resisted, as Theodectes' Philoctetes does when bitten by the snake, or Carcinus' Cercyon in the Alope, and as people who try to restrain their laughter burst out into a guffaw, as happened to Xenophantus. But it is surprising if a man is defeated by and cannot resist pleasures or pains which most men can hold out against, when this is not due to heredity

or disease, like the softness that is hereditary with the kings of the Scythians, or that which distinguishes the female sex from the male.

The lover of amusement, too, is thought to be self-indulgent, but is really soft. For amusement is a relaxation, since it is a rest from work; and the lover of amusement is one of the people who go to excess in this.

Of incontinence one kind is impetuosity, another weakness. For some men after deliberating fail, owing to their emotion, to stand by the conclusions of their deliberation, others because they have not deliberated are led by their emotion; since some men (just as people who first tickle others are not tickled themselves), if they have first perceived and seen what is coming and have first roused themselves and their calculative faculty, are not defeated by their emotion, whether it be pleasant or painful. It is keen and excitable people that suffer especially from the impetuous form of incontinence; for the former by reason of their quickness and the latter by reason of the violence of their passions do not await the argument, because they are apt to follow their imagination.

8

The self-indulgent man, as was said, is not apt to repent; for he stands by his choice; but incontinent man is likely to repent. This is why the position is not as it was expressed in the formulation of the problem, but the selfindulgent man is incurable and the incontinent man curable; for wickedness is like a disease such as dropsy or consumption, while incontinence is like epilepsy; the former is a permanent, the latter an intermittent badness. And generally incontinence and

vice are different in kind; vice is unconscious of itself, incontinence is not (of incontinent men themselves, those who become temporarily beside themselves are better than those who have the rational principle but do not abide by it, since the latter are defeated by a weaker passion, and do not act without previous deliberation like the others); for the incontinent man is like the people who get drunk quickly and on little wine, i.e. on less than most people.

Evidently, then, incontinence is not vice (though perhaps it is so in a qualified sense); for incontinence is contrary to choice while vice is in accordance with choice; not but what they are similar in respect of the actions they lead to; as in the saying of Demodocus about the Milesians, 'the Milesians are not without sense, but they do the things that senseless people do', so too incontinent people are not criminal, but they will do criminal acts.

Now, since the incontinent man is apt to pursue, not on conviction, bodily pleasures that are excessive and contrary to the right rule, while the self-indulgent man is convinced because he is the sort of man to pursue them, it is on the contrary the former that is easily persuaded to change his mind, while the latter is not. For virtue and vice respectively preserve and destroy the first principle, and in actions the final cause is the first principle, as the hypotheses are in mathematics; neither in that case is it argument that teaches the first principles, nor is it so here – virtue either natural or produced by habituation is what teaches right opinion about the first principle. Such a man as this, then, is temperate; his contrary is the self-indulgent.

But there is a sort of man who is carried away as a result of passion and contrary to the right rule – a man whom passion masters so that he does not act according to the right rule, but

does not master to the extent of making him ready to believe that he ought to pursue such pleasures without reserve; this is the incontinent man, who is better than the self-indulgent man, and not bad without qualification; for the best thing in him, the first principle, is preserved. And contrary to him is another kind of man, he who abides by his convictions and is not carried away, at least as a result of passion. It is evident from these considerations that the latter is a good state and the former a bad one.

9

Is the man continent who abides by any and every rule and any and every choice, or the man who abides by the right choice, and is he incontinent who abandons any and every choice and any and every rule, or he who abandons the rule that is not false and the choice that is right; this is how we put it before in our statement of the problem. Or is it incidentally any and every choice but per se the true rule and the right choice by which the one abides and the other does not? If any one chooses or pursues this for the sake of that, per se he pursues and chooses the latter, but incidentally the former. But when we speak without qualification we mean what is per se. Therefore in a sense the one abides by, and the other abandons, any and every opinion; but without qualification, the true opinion.

There are some who are apt to abide by their opinion, who are called strong-headed, viz. those who are hard to persuade in the first instance and are not easily persuaded to change; these have in them something like the continent man, as the prodigal is in a way like the liberal man and the rash man like the confident man; but they are different in many respects. For it is

to passion and appetite that the one will not yield, since on occasion the continent man will be easy to persuade; but it is to argument that the others refuse to yield, for they do form appetites and many of them are led by their pleasures. Now the people who are strong-headed are the opinionated, the ignorant, and the boorish – the opinionated being influenced by pleasure and pain; for they delight in the victory they gain if they are not persuaded to change, and are pained if their decisions become null and void as decrees sometimes do; so that they are liker the incontinent than the continent man.

But there are some who fail to abide by their resolutions, not as a result of incontinence, e.g. Neoptolemus in Sophocles' Philoctetes; yet it was for the sake of pleasure that he did not stand fast – but a noble pleasure; for telling the truth was noble to him, but he had been persuaded by Odysseus to tell the lie. For not every one who does anything for the sake of pleasure is either self-indulgent or bad or incontinent, but he who does it for a disgraceful pleasure.

Since there is also a sort of man who takes less delight than he should in bodily things, and does not abide by the rule, he who is intermediate between him and the incontinent man is the continent man; for the incontinent man fails to abide by the rule because he delights too much in them, and this man because he delights in them too little; while the continent man abides by the rule and does not change on either account. Now if continence is good, both the contrary states must be bad, as they actually appear to be; but because the other extreme is seen in few people and seldom, as temperance is thought to be contrary only to self-indulgence, so is continence to incontinence.

Since many names are applied analogically, it is by analogy that we have come to speak of the 'continence' the temperate man;

for both the continent man and the temperate man are such as to do nothing contrary to the rule for the sake of the bodily pleasures, but the former has and the latter has not bad appetites, and the latter is such as not to feel pleasure contrary to the rule, while the former is such as to feel pleasure but not to be led by it. And the incontinent and the self-indulgent man are also like another; they are different, but both pursue bodily pleasures – the latter, however, also thinking that he ought to do so, while the former does not think this.

10

Nor can the same man have practical wisdom and be incontinent; for it has been shown' that a man is at the same time practically wise, and good in respect of character. Further, a man has practical wisdom not by knowing only but by being able to act; but the incontinent man is unable to act – there is, however, nothing to prevent a clever man from being incontinent; this is why it is sometimes actually thought that some people have practical wisdom but are incontinent, viz. because cleverness and practical wisdom differ in the way we have described in our first discussions, and are near together in respect of their reasoning, but differ in respect of their purpose – nor yet is the incontinent man like the man who knows and is contemplating a truth, but like the man who is asleep or drunk. And he acts willingly (for he acts in a sense with knowledge both of what he does and of the end to which he does it), but is not wicked, since his purpose is good; so that he is half-wicked. And he is not a criminal; for he does not act of malice aforethought; of the two types of incontinent man the one does not abide by the conclusions of his deliberation, while the excitable man does not deliberate at all. And thus the

incontinent man like a city which passes all the right decrees and has good laws, but makes no use of them, as in Anaxandrides' jesting remark,

The city willed it, that cares nought for laws; but the wicked man is like a city that uses its laws, but has wicked laws to use.

Now incontinence and continence are concerned with that which is in excess of the state characteristic of most men; for the continent man abides by his resolutions more and the incontinent man less than most men can.

Of the forms of incontinence, that of excitable people is more curable than that of those who deliberate but do not abide by their decisions, and those who are incontinent through habituation are more curable than those in whom incontinence is innate; for it is easier to change a habit than to change one's nature; even habit is hard to change just because it is like nature, as Evenus says:

I say that habit's but a long practice, friend,

And this becomes men's nature in the end.

We have now stated what continence, incontinence, endurance, and softness are, and how these states are related to each other.

11

The study of pleasure and pain belongs to the province of the political philosopher; for he is the architect of the end, with a view to which we call one thing bad and another good without qualification. Further, it is one of our necessary tasks to consider them; for not only did we lay it down that moral virtue

and vice are concerned with pains and pleasures, but most people say that happiness involves pleasure; this is why the blessed man is called by a name derived from a word meaning enjoyment.

Now (1) some people think that no pleasure is a good, either in itself or incidentally, since the good and pleasure are not the same; (2) others think that some pleasures are good but that most are bad. (3) Again there is a third view, that even if all pleasures are good, yet the best thing in the world cannot be pleasure. (1) The reasons given for the view that pleasure is not a good at all are (a) that every pleasure is a perceptible process to a natural state, and that no process is of the same kind as its end, e.g. no process of building of the same kind as a house. (b) A temperate man avoids pleasures. (c) A man of practical wisdom pursues what is free from pain, not what is pleasant. (d) The pleasures are a hindrance to thought, and the more so the more one delights in them, e.g. in sexual pleasure; for no one could think of anything while absorbed in this. (e) There is no art of pleasure; but every good is the product of some art. (f) Children and the brutes pursue pleasures. (2) The reasons for the view that not all pleasures are good are that (a) there are pleasures that are actually base and objects of reproach, and (b) there are harmful pleasures; for some pleasant things are unhealthy. (3) The reason for the view that the best thing in the world is not pleasure is that pleasure is not an end but a process.

12

These are pretty much the things that are said. That it does not follow from these grounds that pleasure is not a good, or even

the chief good, is plain from the following considerations. (A) (a) First, since that which is good may be so in either of two senses (one thing good simply and another good for a particular person), natural constitutions and states of being, and therefore also the corresponding movements and processes, will be correspondingly divisible. Of those which are thought to be bad some will be bad if taken without qualification but not bad for a particular person, but worthy of his choice, and some will not be worthy of choice even for a particular person, but only at a particular time and for a short period, though not without qualification; while others are not even pleasures, but seem to be so, viz. all those which involve pain and whose end is curative, e.g. the processes that go on in sick persons.

(b) Further, one kind of good being activity and another being state, the processes that restore us to our natural state are only incidentally pleasant; for that matter the activity at work in the appetites for them is the activity of so much of our state and nature as has remained unimpaired; for there are actually pleasures that involve no pain or appetite (e.g. those of contemplation), the nature in such a case not being defective at all. That the others are incidental is indicated by the fact that men do not enjoy the same pleasant objects when their nature is in its settled state as they do when it is being replenished, but in the former case they enjoy the things that are pleasant without qualification, in the latter the contraries of these as well; for then they enjoy even sharp and bitter things, none of which is pleasant either by nature or without qualification. The states they produce, therefore, are not pleasures naturally or without qualification; for as pleasant things differ, so do the pleasures arising from them.

(c) Again, it is not necessary that there should be something else better than pleasure, as some say the end is better than the process; for leasures are not processes nor do they all involve

process – they are activities and ends; nor do they arise when we are becoming something, but when we are exercising some faculty; and not all pleasures have an end different from themselves, but only the pleasures of persons who are being led to the perfecting of their nature. This is why it is not right to say that pleasure is perceptible process, but it should rather be called activity of the natural state, and instead of 'perceptible' 'unimpeded'. It is thought by some people to be process just because they think it is in the strict sense good; for they think that activity is process, which it is not.

(B) The view that pleasures are bad because some pleasant things are unhealthy is like saying that healthy things are bad because some healthy things are bad for money-making; both are bad in the respect mentioned, but they are not bad for that reason – indeed, thinking itself is sometimes injurious to health.

Neither practical wisdom nor any state of being is impeded by the pleasure arising from it; it is foreign pleasures that impede, for the pleasures arising from thinking and learning will make us think and learn all the more.

(C) The fact that no pleasure is the product of any art arises naturally enough; there is no art of any other activity either, but only of the corresponding faculty; though for that matter the arts of the perfumer and the cook are thought to be arts of pleasure.

(D) The arguments based on the grounds that the temperate man avoids pleasure and that the man of practical wisdom pursues the painless life, and that children and the brutes pursue pleasure, are all refuted by the same consideration. We have pointed out in what sense pleasures are good without qualification and in what sense some are not good; now both the brutes and children pursue pleasures of the latter kind (and the man of practical wisdom pursues tranquil freedom from

that kind), viz. those which imply appetite and pain, i.e. the bodily pleasures (for it is these that are of this nature) and the excesses of them, in respect of which the self-indulgent man is self-indulent. This is why the temperate man avoids these pleasures; for even he has pleasures of his own.

13

But further (E) it is agreed that pain is bad and to be avoided; for some pain is without qualification bad, and other pain is bad because it is in some respect an impediment to us. Now the contrary of that which is to be avoided, qua something to be avoided and bad, is good. Pleasure, then, is necessarily a good. For the answer of Speusippus, that pleasure is contrary both to pain and to good, as the greater is contrary both to the less and to the equal, is not successful; since he would not say that pleasure is essentially just a species of evil.

And (F) if certain pleasures are bad, that does not prevent the chief good from being some pleasure, just as the chief good may be some form of knowledge though certain kinds of knowledge are bad. Perhaps it is even necessary, if each disposition has unimpeded activities, that, whether the activity (if unimpeded) of all our dispositions or that of some one of them is happiness, this should be the thing most worthy of our choice; and this activity is pleasure. Thus the chief good would be some pleasure, though most pleasures might perhaps be bad without qualification. And for this reason all men think that the happy life is pleasant and weave pleasure into their ideal of happiness – and reasonably too; for no activity is perfect when it is impeded, and happiness is a perfect thing; this is why the happy man needs the goods of the body and external goods, i.e.

those of fortune, viz. in order that he may not be impeded in these ways. Those who say that the victim on the rack or the man who falls into great misfortunes is happy if he is good, are, whether they mean to or not, talking nonsense. Now because we need fortune as well as other things, some people think good fortune the same thing as happiness; but it is not that, for even good fortune itself when in excess is an impediment, and perhaps should then be no longer called good fortune; for its limit is fixed by reference to happiness.

And indeed the fact that all things, both brutes and men, pursue pleasure is an indication of its being somehow the chief good:

No voice is wholly lost that many peoples... But since no one nature or state either is or is thought the best for all, neither do all pursue the same pleasure; yet all pursue pleasure. And perhaps they actually pursue not the pleasure they think they pursue nor that which they would say they pursue, but the same pleasure; for all things have by nature something divine in them. But the bodily pleasures have appropriated the name both because we oftenest steer our course for them and because all men share in them; thus because they alone are familiar, men think there are no others.

It is evident also that if pleasure, i.e. the activity of our faculties, is not a good, it will not be the case that the happy man lives a pleasant life; for to what end should he need pleasure, if it is not a good but the happy man may even live a painful life? For pain is neither an evil nor a good, if pleasure is not; why then should he avoid it? Therefore, too, the life of the good man will not be pleasanter than that of any one else, if his activities are not more pleasant.

14

(G) With regard to the bodily pleasures, those who say that some pleasures are very much to be chosen, viz. the noble pleasures, but not the bodily pleasures, i.e. those with which the self-indulgent man is concerned, must consider why, then, the contrary pains are bad. For the contrary of bad is good. Are the necessary pleasures good in the sense in which even that which is not bad is good? Or are they good up to a point? Is it that where you have states and processes of which there cannot be too much, there cannot be too much of the corresponding pleasure, and that where there can be too much of the one there can be too much of the other also? Now there can be too much of bodily goods, and the bad man is bad by virtue of pursuing the excess, not by virtue of pursuing the necessary pleasures (for all men enjoy in some way or other both dainty foods and wines and sexual intercourse, but not all men do so as they ought). The contrary is the case with pain; for he does not avoid the excess of it, he avoids it altogether; and this is peculiar to him, for the alternative to excess of pleasure is not pain, except to the man who pursues this excess.

Since we should state not only the truth, but also the cause of error – for this contributes towards producing conviction, since when a reasonable explanation is given of why the false view appears true, this tends to produce belief in the true view – therefore we must state why the bodily pleasures appear the more worthy of choice. (a) Firstly, then, it is because they expel pain; owing to the excesses of pain that men experience, they pursue excessive and in general bodily pleasure as being a cure for the pain. Now curative agencies produce intense feeling – which is the reason why they are pursued – because they show up against the contrary pain. (Indeed pleasure is thought not to be good for these two reasons, as has been said, viz. that (a) some of them are activities belonging to a bad nature – either

congenital, as in the case of a brute, or due to habit, i.e. those of bad men; while (b) others are meant to cure a defective nature, and it is better to be in a healthy state than to be getting into it, but these arise during the process of being made perfect and are therefore only incidentally good.) (b) Further, they are pursued because of their violence by those who cannot enjoy other pleasures. (At all events they go out of their way to manufacture thirsts somehow for themselves. When these are harmless, the practice is irreproachable; when they are hurtful, it is bad.) For they have nothing else to enjoy, and, besides, a neutral state is painful to many people because of their nature. For the animal nature is always in travail, as the students of natural science also testify, saying that sight and hearing are painful; but we have become used to this, as they maintain. Similarly, while, in youth, people are, owing to the growth that is going on, in a situation like that of drunken men, and youth is pleasant, on the other hand people of excitable nature always need relief; for even their body is ever in torment owing to its special composition, and they are always under the influence of violent desire; but pain is driven out both by the contrary pleasure, and by any chance pleasure if it be strong; and for these reasons they become self-indulgent and bad. But the pleasures that do not involve pains do not admit of excess; and these are among the things pleasant by nature and not incidentally. By things pleasant incidentally I mean those that act as cures (for because as a result people are cured, through some action of the part that remains healthy, for this reason the process is thought pleasant); by things naturally pleasant I mean those that stimulate the action of the healthy nature.

There is no one thing that is always pleasant, because our nature is not simple but there is another element in us as well, inasmuch as we are perishable creatures, so that if the one element does something, this is unnatural to the other nature, and when the two elements are evenly balanced, what is done

seems neither painful nor pleasant; for if the nature of anything were simple, the same action would always be most pleasant to it. This is why God always enjoys a single and simple pleasure; for there is not only an activity of movement but an activity of immobility, and pleasure is found more in rest than in movement. But 'change in all things is sweet', as the poet says, because of some vice; for as it is the vicious man that is changeable, so the nature that needs change is vicious; for it is not simple nor good.

We have now discussed continence and incontinence, and pleasure and pain, both what each is and in what sense some of them are good and others bad; it remains to speak of friendship.

Book VIII

1

After what we have said, a discussion of friendship would naturally follow, since it is a virtue or implies virtue, and is besides most necessary with a view to living. For without friends no one would choose to live, though he had all other goods; even rich men and those in possession of office and of dominating power are thought to need friends most of all; for what is the use of such prosperity without the opportunity of beneficence, which is exercised chiefly and in its most laudable form towards friends? Or how can prosperity be guarded and preserved without friends? The greater it is, the more exposed is

it to risk. And in poverty and in other misfortunes men think friends are the only refuge. It helps the young, too, to keep from error; it aids older people by ministering to their needs and supplementing the activities that are failing from weakness; those in the prime of life it stimulates to noble actions – 'two going together' – for with friends men are more able both to think and to act. Again, parent seems by nature to feel it for offspring and offspring for parent, not only among men but among birds and among most animals; it is felt mutually by members of the same race, and especially by men, whence we praise lovers of their fellowmen. We may even in our travels how near and dear every man is to every other. Friendship seems too to hold states together, and lawgivers to care more for it than for justice; for unanimity seems to be something like friendship, and this they aim at most of all, and expel faction as their worst enemy; and when men are friends they have no need of justice, while when they are just they need friendship as well, and the truest form of justice is thought to be a friendly quality.

But it is not only necessary but also noble; for we praise those who love their friends, and it is thought to be a fine thing to have many friends; and again we think it is the same people that are good men and are friends.

Not a few things about friendship are matters of debate. Some define it as a kind of likeness and say like people are friends, whence come the sayings 'like to like', 'birds of a feather flock together', and so on; others on the contrary say 'two of a trade never agree'. On this very question they inquire for deeper and more physical causes, Euripides saying that 'parched earth loves the rain, and stately heaven when filled with rain loves to fall to earth', and Heraclitus that 'it is what opposes that helps' and 'from different tones comes the fairest tune' and 'all things are produced through strife'; while Empedocles, as well as others,

expresses the opposite view that like aims at like. The physical problems we may leave alone (for they do not belong to the present inquiry); let us examine those which are human and involve character and feeling, e.g. whether friendship can arise between any two people or people cannot be friends if they are wicked, and whether there is one species of friendship or more than one. Those who think there is only one because it admits of degrees have relied on an inadequate indication; for even things different in species admit of degree. We have discussed this matter previously.

2

The kinds of friendship may perhaps be cleared up if we first come to know the object of love. For not everything seems to be loved but only the lovable, and this is good, pleasant, or useful; but it would seem to be that by which some good or pleasure is produced that is useful, so that it is the good and the useful that are lovable as ends. Do men love, then, the good, or what is good for them? These sometimes clash. So too with regard to the pleasant. Now it is thought that each loves what is good for himself, and that the good is without qualification lovable, and what is good for each man is lovable for him; but each man loves not what is good for him but what seems good. This however will make no difference; we shall just have to say that this is 'that which seems lovable'. Now there are three grounds on which people love; of the love of lifeless objects we do not use the word 'friendship'; for it is not mutual love, nor is there a wishing of good to the other (for it would surely be ridiculous to wish wine well; if one wishes anything for it, it is that it may keep, so that one may have it oneself); but to a friend we say we ought to wish what is good for his sake. But to those who thus

wish good we ascribe only goodwill, if the wish is not reciprocated; goodwill when it is reciprocal being friendship. Or must we add ‘when it is recognized’? For many people have goodwill to those whom they have not seen but judge to be good or useful; and one of these might return this feeling. These people seem to bear goodwill to each other; but how could one call them friends when they do not know their mutual feelings? To be friends, then, the must be mutually recognized as bearing goodwill and wishing well to each other for one of the aforesaid reasons.

3

Now these reasons differ from each other in kind; so, therefore, do the corresponding forms of love and friendship. There are therefore three kinds of friendship, equal in number to the things that are lovable; for with respect to each there is a mutual and recognized love, and those who love each other wish well to each other in that respect in which they love one another. Now those who love each other for their utility do not love each other for themselves but in virtue of some good which they get from each other. So too with those who love for the sake of pleasure; it is not for their character that men love ready-witted people, but because they find them pleasant. Therefore those who love for the sake of utility love for the sake of what is good for themselves, and those who love for the sake of pleasure do so for the sake of what is pleasant to themselves, and not in so far as the other is the person loved but in so far as he is useful or pleasant. And thus these friendships are only incidental; for it is not as being the man he is that the loved person is loved, but as providing some good or pleasure. Such friendships, then, are easily dissolved, if the parties do not

remain like themselves; for if the one party is no longer pleasant or useful the other ceases to love him.

Now the useful is not permanent but is always changing. Thus when the motive of the friendship is done away, the friendship is dissolved, inasmuch as it existed only for the ends in question. This kind of friendship seems to exist chiefly between old people (for at that age people pursue not the pleasant but the useful) and, of those who are in their prime or young, between those who pursue utility. And such people do not live much with each other either; for sometimes they do not even find each other pleasant; therefore they do not need such companionship unless they are useful to each other; for they are pleasant to each other only in so far as they rouse in each other hopes of something good to come. Among such friendships people also class the friendship of a host and guest. On the other hand the friendship of young people seems to aim at pleasure; for they live under the guidance of emotion, and pursue above all what is pleasant to themselves and what is immediately before them; but with increasing age their pleasures become different. This is why they quickly become friends and quickly cease to be so; their friendship changes with the object that is found pleasant, and such pleasure alters quickly. Young people are amorous too; for the greater part of the friendship of love depends on emotion and aims at pleasure; this is why they fall in love and quickly fall out of love, changing often within a single day. But these people do wish to spend their days and lives together; for it is thus that they attain the purpose of their friendship.

Perfect friendship is the friendship of men who are good, and alike in virtue; for these wish well alike to each other qua good, and they are good themselves. Now those who wish well to their friends for their sake are most truly friends; for they do this by reason of own nature and not incidentally; therefore

their friendship lasts as long as they are good – and goodness is an enduring thing. And each is good without qualification and to his friend, for the good are both good without qualification and useful to each other. So too they are pleasant; for the good are pleasant both without qualification and to each other, since to each his own activities and others like them are pleasurable, and the actions of the good are the same or like. And such a friendship is as might be expected permanent, since there meet in it all the qualities that friends should have. For all friendship is for the sake of good or of pleasure – good or pleasure either in the abstract or such as will be enjoyed by him who has the friendly feeling – and is based on a certain resemblance; and to a friendship of good men all the qualities we have named belong in virtue of the nature of the friends themselves; for in the case of this kind of friendship the other qualities also are alike in both friends, and that which is good without qualification is also without qualification pleasant, and these are the most lovable qualities. Love and friendship therefore are found most and in their best form between such men.

But it is natural that such friendships should be infrequent; for such men are rare. Further, such friendship requires time and familiarity; as the proverb says, men cannot know each other till they have 'eaten salt together'; nor can they admit each other to friendship or be friends till each has been found lovable and been trusted by each. Those who quickly show the marks of friendship to each other wish to be friends, but are not friends unless they both are lovable and know the fact; for a wish for friendship may arise quickly, but friendship does not.

4

This kind of friendship, then, is perfect both in respect of duration and in all other respects, and in it each gets from each in all respects the same as, or something like what, he gives; which is what ought to happen between friends. Friendship for the sake of pleasure bears a resemblance to this kind; for good people too are pleasant to each other. So too does friendship for the sake of utility; for the good are also useful to each other. Among men of these inferior sorts too, friendships are most permanent when the friends get the same thing from each other (e.g. pleasure), and not only that but also from the same source, as happens between readywitted people, not as happens between lover and beloved. For these do not take pleasure in the same things, but the one in seeing the beloved and the other in receiving attentions from his lover; and when the bloom of youth is passing the friendship sometimes passes too (for the one finds no pleasure in the sight of the other, and the other gets no attentions from the first); but many lovers on the other hand are constant, if familiarity has led them to love each other's characters, these being alike. But those who exchange not pleasure but utility in their amour are both less truly friends and less constant. Those who are friends for the sake of utility part when the advantage is at an end; for they were lovers not of each other but of profit.

For the sake of pleasure or utility, then, even bad men may be friends of each other, or good men of bad, or one who is neither good nor bad may be a friend to any sort of person, but for their own sake clearly only good men can be friends; for bad men do not delight in each other unless some advantage come of the relation.

The friendship of the good too and this alone is proof against slander; for it is not easy to trust any one talk about a man who

has long been tested by oneself; and it is among good men that trust and the feeling that 'he would never wrong me' and all the other things that are demanded in true friendship are found. In the other kinds of friendship, however, there is nothing to prevent these evils arising. For men apply the name of friends even to those whose motive is utility, in which sense states are said to be friendly (for the alliances of states seem to aim at advantage), and to those who love each other for the sake of pleasure, in which sense children are called friends. Therefore we too ought perhaps to call such people friends, and say that there are several kinds of friendship – firstly and in the proper sense that of good men qua good, and by analogy the other kinds; for it is in virtue of something good and something akin to what is found in true friendship that they are friends, since even the pleasant is good for the lovers of pleasure. But these two kinds of friendship are not often united, nor do the same people become friends for the sake of utility and of pleasure; for things that are only incidentally connected are not often coupled together.

Friendship being divided into these kinds, bad men will be friends for the sake of pleasure or of utility, being in this respect like each other, but good men will be friends for their own sake, i.e. in virtue of their goodness. These, then, are friends without qualification; the others are friends incidentally and through a resemblance to these.

5

As in regard to the virtues some men are called good in respect of a state of character, others in respect of an activity, so too in the case of friendship; for those who live together delight in

each other and confer benefits on each other, but those who are asleep or locally separated are not performing, but are disposed to perform, the activities of friendship; distance does not break off the friendship absolutely, but only the activity of it. But if the absence is lasting, it seems actually to make men forget their friendship; hence the saying 'out of sight, out of mind'. Neither old people nor sour people seem to make friends easily; for there is little that is pleasant in them, and no one can spend his days with one whose company is painful, or not pleasant, since nature seems above all to avoid the painful and to aim at the pleasant. Those, however, who approve of each other but do not live together seem to be well-disposed rather than actual friends. For there is nothing so characteristic of friends as living together (since while it people who are in need that desire benefits, even those who are supremely happy desire to spend their days together; for solitude suits such people least of all); but people cannot live together if they are not pleasant and do not enjoy the same things, as friends who are companions seem to do.

The truest friendship, then, is that of the good, as we have frequently said; for that which is without qualification good or pleasant seems to be lovable and desirable, and for each person that which is good or pleasant to him; and the good man is lovable and desirable to the good man for both these reasons. Now it looks as if love were a feeling, friendship a state of character; for love may be felt just as much towards lifeless things, but mutual love involves choice and choice springs from a state of character; and men wish well to those whom they love, for their sake, not as a result of feeling but as a result of a state of character. And in loving a friend men love what is good for themselves; for the good man in becoming a friend becomes a good to his friend. Each, then, both loves what is good for himself, and makes an equal return in goodwill and in

pleasantness; for friendship is said to be equality, and both of these are found most in the friendship of the good.

6

Between sour and elderly people friendship arises less readily, inasmuch as they are less good-tempered and enjoy companionship less; for these are thou to be the greatest marks of friendship productive of it. This is why, while men become friends quickly, old men do not; it is because men do not become friends with those in whom they do not delight; and similarly sour people do not quickly make friends either. But such men may bear goodwill to each other; for they wish one another well and aid one another in need; but they are hardly friends because they do not spend their days together nor delight in each other, and these are thought the greatest marks of friendship.

One cannot be a friend to many people in the sense of having friendship of the perfect type with them, just as one cannot be in love with many people at once (for love is a sort of excess of feeling, and it is the nature of such only to be felt towards one person); and it is not easy for many people at the same time to please the same person very greatly, or perhaps even to be good in his eyes. One must, too, acquire some experience of the other person and become familiar with him, and that is very hard. But with a view to utility or pleasure it is possible that many people should please one; for many people are useful or pleasant, and these services take little time.

Of these two kinds that which is for the sake of pleasure is the more like friendship, when both parties get the same things from each other and delight in each other or in the things, as in

the friendships of the young; for generosity is more found in such friendships. Friendship based on utility is for the commercially minded. People who are supremely happy, too, have no need of useful friends, but do need pleasant friends; for they wish to live with some one and, though they can endure for a short time what is painful, no one could put up with it continuously, nor even with the Good itself if it were painful to him; this is why they look out for friends who are pleasant. Perhaps they should look out for friends who, being pleasant, are also good, and good for them too; for so they will have all the characteristics that friends should have.

People in positions of authority seem to have friends who fall into distinct classes; some people are useful to them and others are pleasant, but the same people are rarely both; for they seek neither those whose pleasantness is accompanied by virtue nor those whose utility is with a view to noble objects, but in their desire for pleasure they seek for ready-witted people, and their other friends they choose as being clever at doing what they are told, and these characteristics are rarely combined. Now we have said that the good man is at the same time pleasant and useful; but such a man does not become the friend of one who surpasses him in station, unless he is surpassed also in virtue; if this is not so, he does not establish equality by being proportionally exceeded in both respects. But people who surpass him in both respects are not so easy to find.

However that may be, the aforesaid friendships involve equality; for the friends get the same things from one another and wish the same things for one another, or exchange one thing for another, e.g. pleasure for utility; we have said, however, that they are both less truly friendships and less permanent.

But it is from their likeness and their unlikeness to the same thing that they are thought both to be and not to be friendships.

It is by their likeness to the friendship of virtue that they seem to be friendships (for one of them involves pleasure and the other utility, and these characteristics belong to the friendship of virtue as well); while it is because the friendship of virtue is proof against slander and permanent, while these quickly change (besides differing from the former in many other respects), that they appear not to be friendships; i.e. it is because of their unlikeness to the friendship of virtue.

7

But there is another kind of friendship, viz. that which involves an inequality between the parties, e.g. that of father to son and in general of elder to younger, that of man to wife and in general that of ruler to subject. And these friendships differ also from each other; for it is not the same that exists between parents and children and between rulers and subjects, nor is even that of father to son the same as that of son to father, nor that of husband to wife the same as that of wife to husband. For the virtue and the function of each of these is different, and so are the reasons for which they love; the love and the friendship are therefore different also. Each party, then, neither gets the same from the other, nor ought to seek it; but when children render to parents what they ought to render to those who brought them into the world, and parents render what they should to their children, the friendship of such persons will be abiding and excellent. In all friendships implying inequality the love also should be proportional, i.e. the better should be more loved than he loves, and so should the more useful, and similarly in each of the other cases; for when the love is in proportion to the merit of the parties, then in a sense arises

equality, which is certainly held to be characteristic of friendship.

But equality does not seem to take the same form in acts of justice and in friendship; for in acts of justice what is equal in the primary sense is that which is in proportion to merit, while quantitative equality is secondary, but in friendship quantitative equality is primary and proportion to merit secondary. This becomes clear if there is a great interval in respect of virtue or vice or wealth or anything else between the parties; for then they are no longer friends, and do not even expect to be so. And this is most manifest in the case of the gods; for they surpass us most decisively in all good things. But it is clear also in the case of kings; for with them, too, men who are much their inferiors do not expect to be friends; nor do men of no account expect to be friends with the best or wisest men. In such cases it is not possible to define exactly up to what point friends can remain friends; for much can be taken away and friendship remain, but when one party is removed to a great distance, as God is, the possibility of friendship ceases. This is in fact the origin of the question whether friends really wish for their friends the greatest goods, e.g. that of being gods; since in that case their friends will no longer be friends to them, and therefore will not be good things for them (for friends are good things). The answer is that if we were right in saying that friend wishes good to friend for his sake, his friend must remain the sort of being he is, whatever that may be; therefore it is for him oily so long as he remains a man that he will wish the greatest goods. But perhaps not all the greatest goods; for it is for himself most of all that each man wishes what is good.

8

Most people seem, owing to ambition, to wish to be loved rather than to love; which is why most men love flattery; for the flatterer is a friend in an inferior position, or pretends to be such and to love more than he is loved; and being loved seems to be akin to being honoured, and this is what most people aim at. But it seems to be not for its own sake that people choose honour, but incidentally. For most people enjoy being honoured by those in positions of authority because of their hopes (for they think that if they want anything they will get it from them; and therefore they delight in honour as a token of favour to come); while those who desire honour from good men, and men who know, are aiming at confirming their own opinion of themselves; they delight in honour, therefore, because they believe in their own goodness on the strength of the judgement of those who speak about them. In being loved, on the other hand, people delight for its own sake; whence it would seem to be better than being honoured, and friendship to be desirable in itself. But it seems to lie in loving rather than in being loved, as is indicated by the delight mothers take in loving; for some mothers hand over their children to be brought up, and so long as they know their fate they love them and do not seek to be loved in return (if they cannot have both), but seem to be satisfied if they see them prospering; and they themselves love their children even if these owing to their ignorance give them nothing of a mother's due. Now since friendship depends more on loving, and it is those who love their friends that are praised, loving seems to be the characteristic virtue of friends, so that it is only those in whom this is found in due measure that are lasting friends, and only their friendship that endures.

It is in this way more than any other that even unequals can be friends; they can be equalized. Now equality and likeness are friendship, and especially the likeness of those who are like in

virtue; for being steadfast in themselves they hold fast to each other, and neither ask nor give base services, but (one may say) even prevent them; for it is characteristic of good men neither to go wrong themselves nor to let their friends do so. But wicked men have no steadfastness (for they do not remain even like to themselves), but become friends for a short time because they delight in each other's wickedness. Friends who are useful or pleasant last longer; i.e. as long as they provide each other with enjoyments or advantages. Friendship for utility's sake seems to be that which most easily exists between contraries, e.g. between poor and rich, between ignorant and learned; for what a man actually lacks he aims at, and one gives something else in return. But under this head, too, might bring lover and beloved, beautiful and ugly. This is why lovers sometimes seem ridiculous, when they demand to be loved as they love; if they are equally lovable their claim can perhaps be justified, but when they have nothing lovable about them it is ridiculous. Perhaps, however, contrary does not even aim at contrary by its own nature, but only incidentally, the desire being for what is intermediate; for that is what is good, e.g. it is good for the dry not to become wet but to come to the intermediate state, and similarly with the hot and in all other cases. These subjects we may dismiss; for they are indeed somewhat foreign to our inquiry.

9

Friendship and justice seem, as we have said at the outset of our discussion, to be concerned with the same objects and exhibited between the same persons. For in every community there is thought to be some form of justice, and friendship too; at least men address as friends their fellow-voyagers and

fellowsoldiers, and so too those associated with them in any other kind of community. And the extent of their association is the extent of their friendship, as it is the extent to which justice exists between them. And the proverb 'what friends have is common property' expresses the truth; for friendship depends on community. Now brothers and comrades have all things in common, but the others to whom we have referred have definite things in common – some more things, others fewer; for of friendships, too, some are more and others less truly friendships. And the claims of justice differ too; the duties of parents to children, and those of brothers to each other are not the same, nor those of comrades and those of fellow-citizens, and so, too, with the other kinds of friendship. There is a difference, therefore, also between the acts that are unjust towards each of these classes of associates, and the injustice increases by being exhibited towards those who are friends in a fuller sense; e.g. it is a more terrible thing to defraud a comrade than a fellow-citizen, more terrible not to help a brother than a stranger, and more terrible to wound a father than any one else. And the demands of justice also seem to increase with the intensity of the friendship, which implies that friendship and justice exist between the same persons and have an equal extension.

Now all forms of community are like parts of the political community; for men journey together with a view to some particular advantage, and to provide something that they need for the purposes of life; and it is for the sake of advantage that the political community too seems both to have come together originally and to endure, for this is what legislators aim at, and they call just that which is to the common advantage. Now the other communities aim at advantage bit by bit, e.g. sailors at what is advantageous on a voyage with a view to making money or something of the kind, fellow-soldiers at what is advantageous in war, whether it is wealth or victory or the

taking of a city that they seek, and members of tribes and demes act similarly (Some communities seem to arise for the sake or pleasure, viz. religious guilds and social clubs; for these exist respectively for the sake of offering sacrifice and of companionship. But all these seem to fall under the political community; for it aims not at present advantage but at what is advantageous for life as a whole), offering sacrifices and arranging gatherings for the purpose, and assigning honours to the gods, and providing pleasant relaxations for themselves. For the ancient sacrifices and gatherings seem to take place after the harvest as a sort of firstfruits, because it was at these seasons that people had most leisure. All the communities, then, seem to be parts of the political community; and the particular kinds friendship will correspond to the particular kinds of community.

10

There are three kinds of constitution, and an equal number of deviation-forms – perversions, as it were, of them. The constitutions are monarchy, aristocracy, and thirdly that which is based on a property qualification, which it seems appropriate to call timocratic, though most people are wont to call it polity. The best of these is monarchy, the worst timocracy. The deviation from monarchy is tyrany; for both are forms of one-man rule, but there is the greatest difference between them; the tyrant looks to his own advantage, the king to that of his subjects. For a man is not a king unless he is sufficient to himself and excels his subjects in all good things; and such a man needs nothing further; therefore he will not look to his own interests but to those of his subjects; for a king who is not like that would be a mere titular king. Now tyranny is the very

contrary of this; the tyrant pursues his own good. And it is clearer in the case of tyranny that it is the worst deviation-form; but it is the contrary of the best that is worst. Monarchy passes over into tyranny; for tyranny is the evil form of one-man rule and the bad king becomes a tyrant. Aristocracy passes over into oligarchy by the badness of the rulers, who distribute contrary to equity what belongs to the city – all or most of the good things to themselves, and office always to the same people, paying most regard to wealth; thus the rulers are few and are bad men instead of the most worthy. Timocracy passes over into democracy; for these are coterminous, since it is the ideal even of timocracy to be the rule of the majority, and all who have the property qualification count as equal. Democracy is the least bad of the deviations; for in its case the form of constitution is but a slight deviation. These then are the changes to which constitutions are most subject; for these are the smallest and easiest transitions.

One may find resemblances to the constitutions and, as it were, patterns of them even in households. For the association of a father with his sons bears the form of monarchy, since the father cares for his children; and this is why Homer calls Zeus 'father'; it is the ideal of monarchy to be paternal rule. But among the Persians the rule of the father is tyrannical; they use their sons as slaves. Tyrannical too is the rule of a master over slaves; for it is the advantage of the master that is brought about in it. Now this seems to be a correct form of government, but the Persian type is perverted; for the modes of rule appropriate to different relations are diverse. The association of man and wife seems to be aristocratic; for the man rules in accordance with his worth, and in those matters in which a man should rule, but the matters that befit a woman he hands over to her. If the man rules in everything the relation passes over into oligarchy; for in doing so he is not acting in accordance with their respective worth, and not ruling in virtue

of his superiority. Sometimes, however, women rule, because they are heiresses; so their rule is not in virtue of excellence but due to wealth and power, as in oligarchies. The association of brothers is like timocracy; for they are equal, except in so far as they differ in age; hence if they differ much in age, the friendship is no longer of the fraternal type. Democracy is found chiefly in masterless dwellings (for here every one is on an equality), and in those in which the ruler is weak and every one has licence to do as he pleases.

11

Each of the constitutions may be seen to involve friendship just in so far as it involves justice. The friendship between a king and his subjects depends on an excess of benefits conferred; for he confers benefits on his subjects if being a good man he cares for them with a view to their well-being, as a shepherd does for his sheep (whence Homer called Agamemnon 'shepherd of the peoples'). Such too is the friendship of a father, though this exceeds the other in the greatness of the benefits conferred; for he is responsible for the existence of his children, which is thought the greatest good, and for their nurture and upbringing.

These things are ascribed to ancestors as well. Further, by nature a father tends to rule over his sons, ancestors over descendants, a king over his subjects. These friendships imply superiority of one party over the other, which is why ancestors are honoured. The justice therefore that exists between persons so related is not the same on both sides but is in every case proportioned to merit; for that is true of the friendship as well. The friendship of man and wife, again, is the same that is found in an aristocracy; for it is in accordance with virtue the better

gets more of what is good, and each gets what befits him; and so, too, with the justice in these relations. The friendship of brothers is like that of comrades; for they are equal and of like age, and such persons are for the most part like in their feelings and their character. Like this, too, is the friendship appropriate to timocratic government; for in such a constitution the ideal is for the citizens to be equal and fair; therefore rule is taken in turn, and on equal terms; and the friendship appropriate here will correspond.

But in the deviation-forms, as justice hardly exists, so too does friendship. It exists least in the worst form; in tyranny there is little or no friendship. For where there is nothing common to ruler and ruled, there is not friendship either, since there is not justice; e.g. between craftsman and tool, soul and body, master and slave; the latter in each case is benefited by that which uses it, but there is no friendship nor justice towards lifeless things. But neither is there friendship towards a horse or an ox, nor to a slave qua slave. For there is nothing common to the two parties; the slave is a living tool and the tool a lifeless slave. Qua slave then, one cannot be friends with him. But qua man one can; for there seems to be some justice between any man and any other who can share in a system of law or be a party to an agreement; therefore there can also be friendship with him in so far as he is a man. Therefore while in tyrannies friendship and justice hardly exist, in democracies they exist more fully; for where the citizens are equal they have much in common.

12

Every form of friendship, then, involves association, as has been said. One might, however, mark off from the rest both the

friendship of kindred and that of comrades. Those of fellow-citizens, fellow-tribesmen, fellow-voyagers, and the like are more like mere friendships of association; for they seem to rest on a sort of compact. With them we might class the friendship of host and guest. The friendship of kinsmen itself, while it seems to be of many kinds, appears to depend in every case on parental friendship; for parents love their children as being a part of themselves, and children their parents as being something originating from them. Now (1) arents know their offspring better than there children know that they are their children, and (2) the originator feels his offspring to be his own more than the offspring do their begetter; for the product belongs to the producer (e.g. a tooth or hair or anything else to him whose it is), but the producer does not belong to the product, or belongs in a less degree. And (3) the length of time produces the same result; parents love their children as soon as these are born, but children love their parents only after time has elapsed and they have acquired understanding or the power of discrimination by the senses. From these considerations it is also plain why mothers love more than fathers do. Parents, then, love their children as themselves (for their issue are by virtue of their separate existence a sort of other selves), while children love their parents as being born of them, and brothers love each other as being born of the same parents; for their identity with them makes them identical with each other (which is the reason why people talk of 'the same blood', 'the same stock', and so on). They are, therefore, in a sense the same thing, though in separate individuals. Two things that contribute greatly to friendship are a common upbringing and similarity of age; for 'two of an age take to each other', and people brought up together tend to be comrades; whence the friendship of brothers is akin to that of comrades. And cousins and other kinsmen are bound up together by derivation from brothers, viz. by being derived from the same parents. They come to be closer

together or farther apart by virtue of the nearness or distance of the original ancestor.

The friendship of children to parents, and of men to gods, is a relation to them as to something good and superior; for they have conferred the greatest benefits, since they are the causes of their being and of their nourishment, and of their education from their birth; and this kind of friendship possesses pleasantness and utility also, more than that of strangers, inasmuch as their life is lived more in common. The friendship of brothers has the characteristics found in that of comrades (and especially when these are good), and in general between people who are like each other, inasmuch as they belong more to each other and start with a love for each other from their very birth, and inasmuch as those born of the same parents and brought up together and similarly educated are more akin in character; and the test of time has been applied most fully and convincingly in their case.

Between other kinsmen friendly relations are found in due proportion. Between man and wife friendship seems to exist by nature; for man is naturally inclined to form couples – even more than to form cities, inasmuch as the household is earlier and more necessary than the city, and reproduction is more common to man with the animals. With the other animals the union extends only to this point, but human beings live together not only for the sake of reproduction but also for the various purposes of life; for from the start the functions are divided, and those of man and woman are different; so they help each other by throwing their peculiar gifts into the common stock. It is for these reasons that both utility and pleasure seem to be found in this kind of friendship. But this friendship may be based also on virtue, if the parties are good; for each has its own virtue and they will delight in the fact. And children seem to be a bond of union (which is the reason why

childless people part more easily); for children are a good common to both and what is common holds them together.

How man and wife and in general friend and friend ought mutually to behave seems to be the same question as how it is just for them to behave; for a man does not seem to have the same duties to a friend, a stranger, a comrade, and a schoolfellow.

13

There are three kinds of friendship, as we said at the outset of our inquiry, and in respect of each some are friends on an equality and others by virtue of a superiority (for not only can equally good men become friends but a better man can make friends with a worse, and similarly in friendships of pleasure or utility the friends may be equal or unequal in the benefits they confer). This being so, equals must effect the required equalization on a basis of equality in love and in all other respects, while unequals must render what is in proportion to their superiority or inferiority. Complaints and reproaches arise either only or chiefly in the friendship of utility, and this is only to be expected. For those who are friends on the ground of virtue are anxious to do well by each other (since that is a mark of virtue and of friendship), and between men who are emulating each other in this there cannot be complaints or quarrels; no one is offended by a man who loves him and does well by him – if he is a person of nice feeling he takes his revenge by doing well by the other. And the man who excels the other in the services he renders will not complain of his friend, since he gets what he aims at; for each man desires what is good. Nor do complaints arise much even in friendships of

pleasure; for both get at the same time what they desire, if they enjoy spending their time together; and even a man who complained of another for not affording him pleasure would seem ridiculous, since it is in his power not to spend his days with him.

But the friendship of utility is full of complaints; for as they use each other for their own interests they always want to get the better of the bargain, and think they have got less than they should, and blame their partners because they do not get all they 'want and deserve'; and those who do well by others cannot help them as much as those whom they benefit want.

Now it seems that, as justice is of two kinds, one unwritten and the other legal, one kind of friendship of utility is moral and the other legal. And so complaints arise most of all when men do not dissolve the relation in the spirit of the same type of friendship in which they contracted it. The legal type is that which is on fixed terms; its purely commercial variety is on the basis of immediate payment, while the more liberal variety allows time but stipulates for a definite quid pro quo. In this variety the debt is clear and not ambiguous, but in the postponement it contains an element of friendliness; and so some states do not allow suits arising out of such agreements, but think men who have bargained on a basis of credit ought to accept the consequences. The moral type is not on fixed terms; it makes a gift, or does whatever it does, as to a friend; but one expects to receive as much or more, as having not given but lent; and if a man is worse off when the relation is dissolved than he was when it was contracted he will complain. This happens because all or most men, while they wish for what is noble, choose what is advantageous; now it is noble to do well by another without a view to repayment, but it is the receiving of benefits that is advantageous. Therefore if we can we should return the equivalent of what we have received (for we must not

make a man our friend against his will; we must recognize that we were mistaken at the first and took a benefit from a person we should not have taken it from – since it was not from a friend, nor from one who did it just for the sake of acting so – and we must settle up just as if we had been benefited on fixed terms). Indeed, one would agree to repay if one could (if one could not, even the giver would not have expected one to do so); therefore if it is possible we must repay. But at the outset we must consider the man by whom we are being benefited and on what terms he is acting, in order that we may accept the benefit on these terms, or else decline it.

It is disputable whether we ought to measure a service by its utility to the receiver and make the return with a view to that, or by the benevolence of the giver. For those who have received say they have received from their benefactors what meant little to the latter and what they might have got from others – minimizing the service; while the givers, on the contrary, say it was the biggest thing they had, and what could not have been got from others, and that it was given in times of danger or similar need. Now if the friendship is one that aims at utility, surely the advantage to the receiver is the measure. For it is he that asks for the service, and the other man helps him on the assumption that he will receive the equivalent; so the assistance has been precisely as great as the advantage to the receiver, and therefore he must return as much as he has received, or even more (for that would be nobler). In friendships based on virtue on the other hand, complaints do not arise, but the purpose of the doer is a sort of measure; for in purpose lies the essential element of virtue and character.

14

Differences arise also in friendships based on superiority; for each expects to get more out of them, but when this happens the friendship is dissolved. Not only does the better man think he ought to get more, since more should be assigned to a good man, but the more useful similarly expects this; they say a useless man should not get as much as they should, since it becomes an act of public service and not a friendship if the proceeds of the friendship do not answer to the worth of the benefits conferred. For they think that, as in a commercial partnership those who put more in get more out, so it should be in friendship. But the man who is in a state of need and inferiority makes the opposite claim; they think it is the part of a good friend to help those who are in need; what, they say, is the use of being the friend of a good man or a powerful man, if one is to get nothing out of it?

At all events it seems that each party is justified in his claim, and that each should get more out of the friendship than the other – not more of the same thing, however, but the superior more honour and the inferior more gain; for honour is the prize of virtue and of beneficence, while gain is the assistance required by inferiority.

It seems to be so in constitutional arrangements also; the man who contributes nothing good to the common stock is not honoured; for what belongs to the public is given to the man who benefits the public, and honour does belong to the public. It is not possible to get wealth from the common stock and at the same time honour. For no one puts up with the smaller share in all things; therefore to the man who loses in wealth they assign honour and to the man who is willing to be paid, wealth, since the proportion to merit equalizes the parties and preserves the friendship, as we have said. This then is also the

way in which we should associate with unequals; the man who is benefited in respect of wealth or virtue must give honour in return, repaying what he can. For friendship asks a man to do what he can, not what is proportional to the merits of the case; since that cannot always be done, e.g. in honours paid to the gods or to parents; for no one could ever return to them the equivalent of what he gets, but the man who serves them to the utmost of his power is thought to be a good man. This is why it would not seem open to a man to disown his father (though a father may disown his son); being in debt, he should repay, but there is nothing by doing which a son will have done the equivalent of what he has received, so that he is always in debt. But creditors can remit a debt; and a father can therefore do so too. At the same time it is thought that presumably no one would repudiate a son who was not far gone in wickedness; for apart from the natural friendship of father and son it is human nature not to reject a son's assistance. But the son, if he is wicked, will naturally avoid aiding his father, or not be zealous about it; for most people wish to get benefits, but avoid doing them, as a thing unprofitable. – So much for these questions.

Book IX

1

In all friendships between dissimilars it is, as we have said, proportion that equalizes the parties and preserves the

friendship; e.g. in the political form of friendship the shoemaker gets a return for his shoes in proportion to his worth, and the weaver and all other craftsmen do the same. Now here a common measure has been provided in the form of money, and therefore everything is referred to this and measured by this; but in the friendship of lovers sometimes the lover complains that his excess of love is not met by love in return though perhaps there is nothing lovable about him), while often the beloved complains that the lover who formerly promised everything now performs nothing. Such incidents happen when the lover loves the beloved for the sake of pleasure while the beloved loves the lover for the sake of utility, and they do not both possess the qualities expected of them. If these be the objects of the friendship it is dissolved when they do not get the things that formed the motives of their love; for each did not love the other person himself but the qualities he had, and these were not enduring; that is why the friendships also are transient. But the love of characters, as has been said, endures because it is self-dependent. Differences arise when what they get is something different and not what they desire; for it is like getting nothing at all when we do not get what we aim at; compare the story of the person who made promises to a lyre-player, promising him the more, the better he sang, but in the morning, when the other demanded the fulfilment of his promises, said that he had given pleasure for pleasure. Now if this had been what each wanted, all would have been well; but if the one wanted enjoyment but the other gain, and the one has what he wants while the other has not, the terms of the association will not have been properly fulfilled; for what each in fact wants is what he attends to, and it is for the sake of that that that he will give what he has.

But who is to fix the worth of the service; he who makes the sacrifice or he who has got the advantage? At any rate the other seems to leave it to him. This is what they say Protagoras used

to do; whenever he taught anything whatsoever, he bade the learner assess the value of the knowledge, and accepted the amount so fixed. But in such matters some men approve of the saying 'let a man have his fixed reward'. Those who get the money first and then do none of the things they said they would, owing to the extravagance of their promises, naturally find themselves the objects of complaint; for they do not fulfil what they agreed to. The sophists are perhaps compelled to do this because no one would give money for the things they do know. These people then, if they do not do what they have been paid for, are naturally made the objects of complaint.

But where there is no contract of service, those who give up something for the sake of the other party cannot (as we have said) be complained of (for that is the nature of the friendship of virtue), and the return to them must be made on the basis of their purpose (for it is purpose that is the characteristic thing in a friend and in virtue). And so too, it seems, should one make a return to those with whom one has studied philosophy; for their worth cannot be measured against money, and they can get no honour which will balance their services, but still it is perhaps enough, as it is with the gods and with one's parents, to give them what one can.

If the gift was not of this sort, but was made with a view to a return, it is no doubt preferable that the return made should be one that seems fair to both parties, but if this cannot be achieved, it would seem not only necessary that the person who gets the first service should fix the reward, but also just; for if the other gets in return the equivalent of the advantage the beneficiary has received, or the price lie would have paid for the pleasure, he will have got what is fair as from the other.

We see this happening too with things put up for sale, and in some places there are laws providing that no actions shall arise

out of voluntary contracts, on the assumption that one should settle with a person to whom one has given credit, in the spirit in which one bargained with him. The law holds that it is more just that the person to whom credit was given should fix the terms than that the person who gave credit should do so. For most things are not assessed at the same value by those who have them and those who want them; each class values highly what is its own and what it is offering; yet the return is made on the terms fixed by the receiver. But no doubt the receiver should assess a thing not at what it seems worth when he has it, but at what he assessed it at before he had it.

2

A further problem is set by such questions as, whether one should in all things give the preference to one's father and obey him, or whether when one is ill one should trust a doctor, and when one has to elect a general should elect a man of military skill; and similarly whether one should render a service by preference to a friend or to a good man, and should show gratitude to a benefactor or oblige a friend, if one cannot do both.

All such questions are hard, are they not, to decide with precision? For they admit of many variations of all sorts in respect both of the magnitude of the service and of its nobility necessity. But that we should not give the preference in all things to the same person is plain enough; and we must for the most part return benefits rather than oblige friends, as we must pay back a loan to a creditor rather than make one to a friend. But perhaps even this is not always true; e.g. should a man who has been ransomed out of the hands of brigands ransom his

ransomer in return, whoever he may be (or pay him if he has not been captured but demands payment) or should he ransom his father? It would seem that he should ransom his father in preference even to himself. As we have said, then, generally the debt should be paid, but if the gift is exceedingly noble or exceedingly necessary, one should defer to these considerations. For sometimes it is not even fair to return the equivalent of what one has received, when the one man has done a service to one whom he knows to be good, while the other makes a return to one whom he believes to be bad. For that matter, one should sometimes not lend in return to one who has lent to oneself; for the one person lent to a good man, expecting to recover his loan, while the other has no hope of recovering from one who is believed to be bad. Therefore if the facts really are so, the demand is not fair; and if they are not, but people think they are, they would be held to be doing nothing strange in refusing. As we have often pointed out, then, discussions about feelings and actions have just as much definiteness as their subject-matter.

That we should not make the same return to every one, nor give a father the preference in everything, as one does not sacrifice everything to Zeus, is plain enough; but since we ought to render different things to parents, brothers, comrades, and benefactors, we ought to render to each class what is appropriate and becoming. And this is what people seem in fact to do; to marriages they invite their kinsfolk; for these have a part in the family and therefore in the doings that affect the family; and at funerals also they think that kinsfolk, before all others, should meet, for the same reason. And it would be thought that in the matter of food we should help our parents before all others, since we owe our own nourishment to them, and it is more honourable to help in this respect the authors of our being even before ourselves; and honour too one should give to one's parents as one does to the gods, but not any and

every honour; for that matter one should not give the same honour to one's father and one's mother, nor again should one give them the honour due to a philosopher or to a general, but the honour due to a father, or again to a mother. To all older persons, too, one should give honour appropriate to their age, by rising to receive them and finding seats for them and so on; while to comrades and brothers one should allow freedom of speech and common use of all things. To kinsmen, too, and fellow-tribesmen and fellow-citizens and to every other class one should always try to assign what is appropriate, and to compare the claims of each class with respect to nearness of relation and to virtue or usefulness. The comparison is easier when the persons belong to the same class, and more laborious when they are different. Yet we must not on that account shrink from the task, but decide the question as best we can.

3

Another question that arises is whether friendships should or should not be broken off when the other party does not remain the same. Perhaps we may say that there is nothing strange in breaking off a friendship based on utility or pleasure, when our friends no longer have these attributes. For it was of these attributes that we were the friends; and when these have failed it is reasonable to love no longer. But one might complain of another if, when he loved us for our usefulness or pleasantness, he pretended to love us for our character. For, as we said at the outset, most differences arise between friends when they are not friends in the spirit in which they think they are. So when a man has deceived himself and has thought he was being loved for his character, when the other person was doing nothing of the kind, he must blame himself; when he has been deceived by

the pretences of the other person, it is just that he should complain against his deceiver; he will complain with more justice than one does against people who counterfeit the currency, inasmuch as the wrongdoing is concerned with something more valuable.

But if one accepts another man as good, and he turns out badly and is seen to do so, must one still love him? Surely it is impossible, since not everything can be loved, but only what is good. What is evil neither can nor should be loved; for it is not one’s duty to be a lover of evil, nor to become like what is bad; and we have said that like is dear like. Must the friendship, then, be forthwith broken off? Or is this not so in all cases, but only when one’s friends are incurable in their wickedness? If they are capable of being reformed one should rather come to the assistance of their character or their property, inasmuch as this is better and more characteristic of friendship. But a man who breaks off such a friendship would seem to be doing nothing strange; for it was not to a man of this sort that he was a friend; when his friend has changed, therefore, and he is unable to save him, he gives him up.

But if one friend remained the same while the other became better and far outstripped him in virtue, should the latter treat the former as a friend? Surely he cannot. When the interval is great this becomes most plain, e.g. in the case of childish friendships; if one friend remained a child in intellect while the other became a fully developed man, how could they be friends when they neither approved of the same things nor delighted in and were pained by the same things? For not even with regard to each other will their tastes agree, and without this (as we saw) they cannot be friends; for they cannot live together. But we have discussed these matters.

Should he, then, behave no otherwise towards him than he would if he had never been his friend? Surely he should keep a remembrance of their former intimacy, and as we think we ought to oblige friends rather than strangers, so to those who have been our friends we ought to make some allowance for our former friendship, when the breach has not been due to excess of wickedness.

4

Friendly relations with one's neighbours, and the marks by which friendships are defined, seem to have proceeded from a man's relations to himself. For (1) we define a friend as one who wishes and does what is good, or seems so, for the sake of his friend, or (2) as one who wishes his friend to exist and live, for his sake; which mothers do to their children, and friends do who have come into conflict. And (3) others define him as one who lives with and (4) has the same tastes as another, or (5) one who grieves and rejoices with his friend; and this too is found in mothers most of all. It is by some one of these characterstics that friendship too is defined.

Now each of these is true of the good man's relation to himself (and of all other men in so far as they think themselves good; virtue and the good man seem, as has been said, to be the measure of every class of things). For his opinions are harmonious, and he desires the same things with all his soul; and therefore he wishes for himself what is good and what seems so, and does it (for it is characteristic of the good man to work out the good), and does so for his own sake (for he does it for the sake of the intellectual element in him, which is thought to be the man himself); and he wishes himself to live and be

preserved, and especially the element by virtue of which he thinks. For existence is good to the virtuous man, and each man wishes himself what is good, while no one chooses to possess the whole world if he has first to become some one else (for that matter, even now God possesses the good); he wishes for this only on condition of being whatever he is; and the element that thinks would seem to be the individual man, or to be so more than any other element in him. And such a man wishes to live with himself; for he does so with pleasure, since the memories of his past acts are delightful and his hopes for the future are good, and therefore pleasant. His mind is well stored too with subjects of contemplation. And he grieves and rejoices, more than any other, with himself; for the same thing is always painful, and the same thing always pleasant, and not one thing at one time and another at another; he has, so to speak, nothing to repent of.

Therefore, since each of these characteristics belongs to the good man in relation to himself, and he is related to his friend as to himself (for his friend is another self), friendship too is thought to be one of these attributes, and those who have these attributes to be friends. Whether there is or is not friendship between a man and himself is a question we may dismiss for the present; there would seem to be friendship in so far as he is two or more, to judge from the afore-mentioned attributes of friendship, and from the fact that the extreme of friendship is likened to one's love for oneself.

But the attributes named seem to belong even to the majority of men, poor creatures though they may be. Are we to say then that in so far as they are satisfied with themselves and think they are good, they share in these attributes? Certainly no one who is thoroughly bad and impious has these attributes, or even seems to do so. They hardly belong even to inferior people; for they are at variance with themselves, and have appetites for

some things and rational desires for others. This is true, for instance, of incontinent people; for they choose, instead of the things they themselves think good, things that are pleasant but hurtful; while others again, through cowardice and laziness, shrink from doing what they think best for themselves. And those who have done many terrible deeds and are hated for their wickedness even shrink from life and destroy themselves. And wicked men seek for people with whom to spend their days, and shun themselves; for they remember many a grevious deed, and anticipate others like them, when they are by themselves, but when they are with others they forget. And having nothing lovable in them they have no feeling of love to themselves. Therefore also such men do not rejoice or grieve with themselves; for their soul is rent by faction, and one element in it by reason of its wickedness grieves when it abstains from certain acts, while the other part is pleased, and one draws them this way and the other that, as if they were pulling them in pieces. If a man cannot at the same time be pained and pleased, at all events after a short time he is pained because he was pleased, and he could have wished that these things had not been pleasant to him; for bad men are laden with repentance.

Therefore the bad man does not seem to be amicably disposed even to himself, because there is nothing in him to love; so that if to be thus is the height of wretchedness, we should strain every nerve to avoid wickedness and should endeavour to be good; for so and only so can one be either friendly to oneself or a friend to another.

5

Goodwill is a friendly sort of relation, but is not identical with friendship; for one may have goodwill both towards people whom one does not know, and without their knowing it, but not friendship. This has indeed been said already.' But goodwill is not even friendly feeling. For it does not involve intensity or desire, whereas these accompany friendly feeling; and friendly feeling implies intimacy while goodwill may arise of a sudden, as it does towards competitors in a contest; we come to feel goodwill for them and to share in their wishes, but we would not do anything with them; for, as we said, we feel goodwill suddenly and love them only superficially.

Goodwill seems, then, to be a beginning of friendship, as the pleasure of the eye is the beginning of love. For no one loves if he has not first been delighted by the form of the beloved, but he who delights in the form of another does not, for all that, love him, but only does so when he also longs for him when absent and craves for his presence; so too it is not possible for people to be friends if they have not come to feel goodwill for each other, but those who feel goodwill are not for all that friends; for they only wish well to those for whom they feel goodwill, and would not do anything with them nor take trouble for them. And so one might by an extension of the term friendship say that goodwill is inactive friendship, though when it is prolonged and reaches the point of intimacy it becomes friendship – not the friendship based on utility nor that based on pleasure; for goodwill too does not arise on those terms. The man who has received a benefit bestows goodwill in return for what has been done to him, but in doing so is only doing what is just; while he who wishes some one to prosper because he hopes for enrichment through him seems to have goodwill not to him but rather to himself, just as a man is not a friend to another if he cherishes him for the sake of some use to be made

of him. In general, goodwill arises on account of some excellence and worth, when one man seems to another beautiful or brave or something of the sort, as we pointed out in the case of competitors in a contest.

6

Unanimity also seems to be a friendly relation. For this reason it is not identity of opinion; for that might occur even with people who do not know each other; nor do we say that people who have the same views on any and every subject are unanimous, e.g. those who agree about the heavenly bodies (for unanimity about these is not a friendly relation), but we do say that a city is unanimous when men have the same opinion about what is to their interest, and choose the same actions, and do what they have resolved in common. It is about things to be done, therefore, that people are said to be unanimous, and, among these, about matters of consequence and in which it is possible for both or all parties to get what they want; e.g. a city is unanimous when all its citizens think that the offices in it should be elective, or that they should form an alliance with Sparta, or that Pittacus should be their ruler – at a time when he himself was also willing to rule. But when each of two people wishes himself to have the thing in question, like the captains in the Phoenissae, they are in a state of faction; for it is not unanimity when each of two parties thinks of the same thing, whatever that may be, but only when they think of the same thing in the same hands, e.g. when both the common people and those of the better class wish the best men to rule; for thus and thus alone do all get what they aim at. Unanimity seems, then, to be political friendship, as indeed it is commonly said to

be; for it is concerned with things that are to our interest and have an influence on our life.

Now such unanimity is found among good men; for they are unanimous both in themselves and with one another, being, so to say, of one mind (for the wishes of such men are constant and not at the mercy of opposing currents like a strait of the sea), and they wish for what is just and what is advantageous, and these are the objects of their common endeavour as well. But bad men cannot be unanimous except to a small extent, any more than they can be friends, since they aim at getting more than their share of advantages, while in labour and public service they fall short of their share; and each man wishing for advantage to himself criticizes his neighbour and stands in his way; for if people do not watch it carefully the common weal is soon destroyed. The result is that they are in a state of faction, putting compulsion on each other but unwilling themselves to do what is just.

7

Benefactors are thought to love those they have benefited, more than those who have been well treated love those that have treated them well, and this is discussed as though it were paradoxical. Most people think it is because the latter are in the position of debtors and the former of creditors; and therefore as, in the case of loans, debtors wish their creditors did not exist, while creditors actually take care of the safety of their debtors, so it is thought that benefactors wish the objects of their action to exist since they will then get their gratitude, while the beneficiaries take no interest in making this return. Epicharmus would perhaps declare that they say this because they 'look at

things on their bad side', but it is quite like human nature; for most people are forgetful, and are more anxious to be well treated than to treat others well. But the cause would seem to be more deeply rooted in the nature of things; the case of those who have lent money is not even analogous. For they have no friendly feeling to their debtors, but only a wish that they may kept safe with a view to what is to be got from them; while those who have done a service to others feel friendship and love for those they have served even if these are not of any use to them and never will be. This is what happens with craftsmen too; every man loves his own handiwork better than he would be loved by it if it came alive; and this happens perhaps most of all with poets; for they have an excessive love for their own poems, doting on them as if they were their children. This is what the position of benefactors is like; for that which they have treated well is their handiwork, and therefore they love this more than the handiwork does its maker. The cause of this is that existence is to all men a thing to be chosen and loved, and that we exist by virtue of activity (i.e. by living and acting), and that the handiwork is in a sense, the producer in activity; he loves his handiwork, therefore, because he loves existence. And this is rooted in the nature of things; for what he is in potentiality, his handiwork manifests in activity.

At the same time to the benefactor that is noble which depends on his action, so that he delights in the object of his action, whereas to the patient there is nothing noble in the agent, but at most something advantageous, and this is less pleasant and lovable. What is pleasant is the activity of the present, the hope of the future, the memory of the past; but most pleasant is that which depends on activity, and similarly this is most lovable. Now for a man who has made something his work remains (for the noble is lasting), but for the person acted on the utility passes away. And the memory of noble things is pleasant, but

that of useful things is not likely to be pleasant, or is less so; though the reverse seems true of expectation.

Further, love is like activity, being loved like passivity; and loving and its concomitants are attributes of those who are the more active.

Again, all men love more what they have won by labour; e.g. those who have made their money love it more than those who have inherited it; and to be well treated seems to involve no labour, while to treat others well is a laborious task. These are the reasons, too, why mothers are fonder of their children than fathers; bringing them into the world costs them more pains, and they know better that the children are their own. This last point, too, would seem to apply to benefactors.

8

The question is also debated, whether a man should love himself most, or some one else. People criticize those who love themselves most, and call them self-lovers, using this as an epithet of disgrace, and a bad man seems to do everything for his own sake, and the more so the more wicked he is – and so men reproach him, for instance, with doing nothing of his own accord – while the good man acts for honour's sake, and the more so the better he is, and acts for his friend's sake, and sacrifices his own interest.

But the facts clash with these arguments, and this is not surprising. For men say that one ought to love best one's best friend, and man's best friend is one who wishes well to the object of his wish for his sake, even if no one is to know of it; and these attributes are found most of all in a man's attitude

towards himself, and so are all the other attributes by which a friend is defined; for, as we have said, it is from this relation that all the characteristics of friendship have extended to our neighbours. All the proverbs, too, agree with this, e.g. ‘a single soul’, and ‘what friends have is common property’, and ‘friendship is equality’, and ‘charity begins at home’; for all these marks will be found most in a man’s relation to himself; he is his own best friend and therefore ought to love himself best. It is therefore a reasonable question, which of the two views we should follow; for both are plausible.

Perhaps we ought to mark off such arguments from each other and determine how far and in what respects each view is right. Now if we grasp the sense in which each school uses the phrase ‘lover of self’, the truth may become evident. Those who use the term as one of reproach ascribe self-love to people who assign to themselves the greater share of wealth, honours, and bodily pleasures; for these are what most people desire, and busy themselves about as though they were the best of all things, which is the reason, too, why they become objects of competition. So those who are grasping with regard to these things gratify their appetites and in general their feelings and the irrational element of the soul; and most men are of this nature (which is the reason why the epithet has come to be used as it is – it takes its meaning from the prevailing type of self-love, which is a bad one); it is just, therefore, that men who are lovers of self in this way are reproached for being so. That it is those who give themselves the preference in regard to objects of this sort that most people usually call lovers of self is plain; for if a man were always anxious that he himself, above all things, should act justly, temperately, or in accordance with any other of the virtues, and in general were always to try to secure for himself the honourable course, no one will call such a man a lover of self or blame him.

But such a man would seem more than the other a lover of self; at all events he assigns to himself the things that are noblest and best, and gratifies the most authoritative element in and in all things obeys this; and just as a city or any other systematic whole is most properly identified with the most authoritative element in it, so is a man; and therefore the man who loves this and gratifies it is most of all a lover of self. Besides, a man is said to have or not to have self-control according as his reason has or has not the control, on the assumption that this is the man himself; and the things men have done on a rational principle are thought most properly their own acts and voluntary acts. That this is the man himself, then, or is so more than anything else, is plain, and also that the good man loves most this part of him. Whence it follows that he is most truly a lover of self, of another type than that which is a matter of reproach, and as different from that as living according to a rational principle is from living as passion dictates, and desiring what is noble from desiring what seems advantageous. Those, then, who busy themselves in an exceptional degree with noble actions all men approve and praise; and if all were to strive towards what is noble and strain every nerve to do the noblest deeds, everything would be as it should be for the common weal, and every one would secure for himself the goods that are greatest, since virtue is the greatest of goods.

Therefore the good man should be a lover of self (for he will both himself profit by doing noble acts, and will benefit his fellows), but the wicked man should not; for he will hurt both himself and his neighbours, following as he does evil passions. For the wicked man, what he does clashes with what he ought to do, but what the good man ought to do he does; for reason in each of its possessors chooses what is best for itself, and the good man obeys his reason. It is true of the good man too that he does many acts for the sake of his friends and his country, and if necessary dies for them; for he will throw away both

wealth and honours and in general the goods that are objects of competition, gaining for himself nobility; since he would prefer a short period of intense pleasure to a long one of mild enjoyment, a twelvemonth of noble life to many years of humdrum existence, and one great and noble action to many trivial ones. Now those who die for others doubtless attain this result; it is therefore a great prize that they choose for themselves. They will throw away wealth too on condition that their friends will gain more; for while a man's friend gains wealth he himself achieves nobility; he is therefore assigning the greater good to himself. The same too is true of honour and office; all these things he will sacrifice to his friend; for this is noble and laudable for himself. Rightly then is he thought to be good, since he chooses nobility before all else. But he may even give up actions to his friend; it may be nobler to become the cause of his friend's acting than to act himself. In all the actions, therefore, that men are praised for, the good man is seen to assign to himself the greater share in what is noble. In this sense, then, as has been said, a man should be a lover of self; but in the sense in which most men are so, he ought not.

9

It is also disputed whether the happy man will need friends or not. It is said that those who are supremely happy and self-sufficient have no need of friends; for they have the things that are good, and therefore being self-sufficient they need nothing further, while a friend, being another self, furnishes what a man cannot provide by his own effort; whence the saying 'when fortune is kind, what need of friends?' But it seems strange, when one assigns all good things to the happy man, not to assign friends, who are thought the greatest of external goods.

And if it is more characteristic of a friend to do well by another than to be well done by, and to confer benefits is characteristic of the good man and of virtue, and it is nobler to do well by friends than by strangers, the good man will need people to do well by. This is why the question is asked whether we need friends more in prosperity or in adversity, on the assumption that not only does a man in adversity need people to confer benefits on him, but also those who are prospering need people to do well by. Surely it is strange, too, to make the supremely happy man a solitary; for no one would choose the whole world on condition of being alone, since man is a political creature and one whose nature is to live with others. Therefore even the happy man lives with others; for he has the things that are by nature good. And plainly it is better to spend his days with friends and good men than with strangers or any chance persons. Therefore the happy man needs friends.

What then is it that the first school means, and in what respect is it right? Is it that most identify friends with useful people? Of such friends indeed the supremely happy man will have no need, since he already has the things that are good; nor will he need those whom one makes one's friends because of their pleasantness, or he will need them only to a small extent (for his life, being pleasant, has no need of adventitious pleasure); and because he does not need such friends he is thought not to need friends.

But that is surely not true. For we have said at the outset that happiness is an activity; and activity plainly comes into being and is not present at the start like a piece of property. If (1) happiness lies in living and being active, and the good man's activity is virtuous and pleasant in itself, as we have said at the outset, and (2) a thing's being one's own is one of the attributes that make it pleasant, and (3) we can contemplate our neighbours better than ourselves and their actions better than

our own, and if the actions of virtuous men who are their friends are pleasant to good men (since these have both the attributes that are naturally pleasant), – if this be so, the supremely happy man will need friends of this sort, since his purpose is to contemplate worthy actions and actions that are his own, and the actions of a good man who is his friend have both these qualities.

Further, men think that the happy man ought to live pleasantly. Now if he were a solitary, life would be hard for him; for by oneself it is not easy to be continuously active; but with others and towards others it is easier. With others therefore his activity will be more continuous, and it is in itself pleasant, as it ought to be for the man who is supremely happy; for a good man qua good delights in virtuous actions and is vexed at vicious ones, as a musical man enjoys beautiful tunes but is pained at bad ones. A certain training in virtue arises also from the company of the good, as Theognis has said before us.

If we look deeper into the nature of things, a virtuous friend seems to be naturally desirable for a virtuous man. For that which is good by nature, we have said, is for the virtuous man good and pleasant in itself. Now life is defined in the case of animals by the power of perception in that of man by the power of perception or thought; and a power is defined by reference to the corresponding activity, which is the essential thing; therefore life seems to be essentially the act of perceiving or thinking. And life is among the things that are good and pleasant in themselves, since it is determinate and the determinate is of the nature of the good; and that which is good by nature is also good for the virtuous man (which is the reason why life seems pleasant to all men); but we must not apply this to a wicked and corrupt life nor to a life spent in pain; for such a life is indeterminate, as are its attributes. The nature of pain will become plainer in what follows. But if life itself is good and

pleasant (which it seems to be, from the very fact that all men desire it, and particularly those who are good and supremely happy; for to such men life is most desirable, and their existence is the most supremely happy) and if he who sees perceives that he sees, and he who hears, that he hears, and he who walks, that he walks, and in the case of all other activities similarly there is something which perceives that we are active, so that if we perceive, we perceive that we perceive, and if we think, that we think; and if to perceive that we perceive or think is to perceive that we exist (for existence was defined as perceiving or thinking); and if perceiving that one lives is in itself one of the things that are pleasant (for life is by nature good, and to perceive what is good present in oneself is pleasant); and if life is desirable, and particularly so for good men, because to them existence is good and pleasant for they are pleased at the consciousness of the presence in them of what is in itself good); and if as the virtuous man is to himself, he is to his friend also (for his friend is another self): – if all this be true, as his own being is desirable for each man, so, or almost so, is that of his friend. Now his being was seen to be desirable because he perceived his own goodness, and such perception is pleasant in itself. He needs, therefore, to be conscious of the existence of his friend as well, and this will be realized in their living together and sharing in discussion and thought; for this is what living together would seem to mean in the case of man, and not, as in the case of cattle, feeding in the same place.

If, then, being is in itself desirable for the supremely happy man (since it is by its nature good and pleasant), and that of his friend is very much the same, a friend will be one of the things that are desirable. Now that which is desirable for him he must have, or he will be deficient in this respect. The man who is to be happy will therefore need virtuous friends.

10

Should we, then, make as many friends as possible, or – as in the case of hospitality it is thought to be suitable advice, that one should be ‘neither a man of many guests nor a man with none’ – will that apply to friendship as well; should a man neither be friendless nor have an excessive number of friends?

To friends made with a view to utility this saying would seem thoroughly applicable; for to do services to many people in return is a laborious task and life is not long enough for its performance. Therefore friends in excess of those who are sufficient for our own life are superfluous, and hindrances to the noble life; so that we have no need of them. Of friends made with a view to pleasure, also, few are enough, as a little seasoning in food is enough.

But as regards good friends, should we have as many as possible, or is there a limit to the number of one’s friends, as there is to the size of a city? You cannot make a city of ten men, and if there are a hundred thousand it is a city no longer. But the proper number is presumably not a single number, but anything that falls between certain fixed points. So for friends too there is a fixed number perhaps the largest number with whom one can live together (for that, we found, thought to be very characteristic of friendship); and that one cannot live with many people and divide oneself up among them is plain. Further, they too must be friends of one another, if they are all to spend their days together; and it is a hard business for this condition to be fulfilled with a large number. It is found difficult, too, to rejoice and to grieve in an intimate way with many people, for it may likely happen that one has at once to be happy with one friend and to mourn with another. Presumably, then, it is well not to seek to have as many friends as possible,

but as many as are enough for the purpose of living together; for it would seem actually impossible to be a great friend to many people. This is why one cannot love several people; love is ideally a sort of excess of friendship, and that can only be felt towards one person; therefore great friendship too can only be felt towards a few people. This seems to be confirmed in practice; for we do not find many people who are friends in the comradely way of friendship, and the famous friendships of this sort are always between two people. Those who have many friends and mix intimately with them all are thought to be no one's friend, except in the way proper to fellow-citizens, and such people are also called obsequious. In the way proper to fellow-citizens, indeed, it is possible to be the friend of many and yet not be obsequious but a genuinely good man; but one cannot have with many people the friendship based on virtue and on the character of our friends themselves, and we must be content if we find even a few such.

11

Do we need friends more in good fortune or in bad? They are sought after in both; for while men in adversity need help, in prosperity they need people to live with and to make the objects of their beneficence; for they wish to do well by others. Friendship, then, is more necessary in bad fortune, and so it is useful friends that one wants in this case; but it is more noble in good fortune, and so we also seek for good men as our friends, since it is more desirable to confer benefits on these and to live with these. For the very presence of friends is pleasant both in good fortune and also in bad, since grief is lightened when friends sorrow with us. Hence one might ask whether they share as it were our burden, or – without that

happening – their presence by its pleasantness, and the thought of their grieving with us, make our pain less. Whether it is for these reasons or for some other that our grief is lightened, is a question that may be dismissed; at all events what we have described appears to take place.

But their presence seems to contain a mixture of various factors. The very seeing of one's friends is pleasant, especially if one is in adversity, and becomes a safeguard against grief (for a friend tends to comfort us both by the sight of him and by his words, if he is tactful, since he knows our character and the things that please or pain us); but to see him pained at our misfortunes is painful; for every one shuns being a cause of pain to his friends. For this reason people of a manly nature guard against making their friends grieve with them, and, unless he be exceptionally insensible to pain, such a man cannot stand the pain that ensues for his friends, and in general does not admit fellow-mourners because he is not himself given to mourning; but women and womanly men enjoy sympathisers in their grief, and love them as friends and companions in sorrow. But in all things one obviously ought to imitate the better type of person.

On the other hand, the presence of friends in our prosperity implies both a pleasant passing of our time and the pleasant thought of their pleasure at our own good fortune. For this cause it would seem that we ought to summon our friends readily to share our good fortunes (for the beneficent character is a noble one), but summon them to our bad fortunes with hesitation; for we ought to give them as little a share as possible in our evils whence the saying 'enough is my misfortune'. We should summon friends to us most of all when they are likely by suffering a few inconveniences to do us a great service.

Conversely, it is fitting to go unasked and readily to the aid of those in adversity (for it is characteristic of a friend to render services, and especially to those who are in need and have not demanded them; such action is nobler and pleasanter for both persons); but when our friends are prosperous we should join readily in their activities (for they need friends for these too), but be tardy in coming forward to be the objects of their kindness; for it is not noble to be keen to receive benefits. Still, we must no doubt avoid getting the reputation of kill-joys by repulsing them; for that sometimes happens.

The presence of friends, then, seems desirable in all circumstances.

12

Does it not follow, then, that, as for lovers the sight of the beloved is the thing they love most, and they prefer this sense to the others because on it love depends most for its being and for its origin, so for friends the most desirable thing is living together? For friendship is a partnership, and as a man is to himself, so is he to his friend; now in his own case the consciousness of his being is desirable, and so therefore is the consciousness of his friend's being, and the activity of this consciousness is produced when they live together, so that it is natural that they aim at this. And whatever existence means for each class of men, whatever it is for whose sake they value life, in that they wish to occupy themselves with their friends; and so some drink together, others dice together, others join in athletic exercises and hunting, or in the study of philosophy, each class spending their days together in whatever they love most in life; for since they wish to live with their friends, they

do and share in those things which give them the sense of living together. Thus the friendship of bad men turns out an evil thing (for because of their instability they unite in bad pursuits, and besides they become evil by becoming like each other), while the friendship of good men is good, being augmented by their companionship; and they are thought to become better too by their activities and by improving each other; for from each other they take the mould of the characteristics they approve – whence the saying 'noble deeds from noble men'. – So much, then, for friendship; our next task must be to discuss pleasure.

Book X

1

After these matters we ought perhaps next to discuss pleasure. For it is thought to be most intimately connected with our human nature, which is the reason why in educating the young we steer them by the rudders of pleasure and pain; it is thought, too, that to enjoy the things we ought and to hate the things we ought has the greatest bearing on virtue of character. For these things extend right through life, with a weight and power of their own in respect both to virtue and to the happy life, since men choose what is pleasant and avoid what is painful; and such things, it will be thought, we should least of all omit to discuss, especially since they admit of much dispute. For some

say pleasure is the good, while others, on the contrary, say it is thoroughly bad – some no doubt being persuaded that the facts are so, and others thinking it has a better effect on our life to exhibit pleasure as a bad thing even if it is not; for most people (they think) incline towards it and are the slaves of their pleasures, for which reason they ought to lead them in the opposite direction, since thus they will reach the middle state. But surely this is not correct. For arguments about matters concerned with feelings and actions are less reliable than facts: and so when they clash with the facts of perception they are despised, and discredit the truth as well; if a man who runs down pleasure is once seen to be alming at it, his inclining towards it is thought to imply that it is all worthy of being aimed at; for most people are not good at drawing distinctions. True arguments seem, then, most useful, not only with a view to knowledge, but with a view to life also; for since they harmonize with the facts they are believed, and so they stimulate those who understand them to live according to them. – Enough of such questions; let us proceed to review the opinions that have been expressed about pleasure.

2

Eudoxus thought pleasure was the good because he saw all things, both rational and irrational, aiming at it, and because in all things that which is the object of choice is what is excellent, and that which is most the object of choice the greatest good; thus the fact that all things moved towards the same object indicated that this was for all things the chief good (for each thing, he argued, finds its own good, as it finds its own nourishment); and that which is good for all things and at which all aim was the good. His arguments were credited more

because of the excellence of his character than for their own sake; he was thought to be remarkably self-controlled, and therefore it was thought that he was not saying what he did say as a friend of pleasure, but that the facts really were so. He believed that the same conclusion followed no less plainly from a study of the contrary of pleasure; pain was in itself an object of aversion to all things, and therefore its contrary must be similarly an object of choice. And again that is most an object of choice which we choose not because or for the sake of something else, and pleasure is admittedly of this nature; for no one asks to what end he is pleased, thus implying that pleasure is in itself an object of choice. Further, he argued that pleasure when added to any good, e.g. to just or temperate action, makes it more worthy of choice, and that it is only by itself that the good can be increased.

This argument seems to show it to be one of the goods, and no more a good than any other; for every good is more worthy of choice along with another good than taken alone. And so it is by an argument of this kind that Plato proves the good not to be pleasure; he argues that the pleasant life is more desirable with wisdom than without, and that if the mixture is better, pleasure is not the good; for the good cannot become more desirable by the addition of anything to it. Now it is clear that nothing else, any more than pleasure, can be the good if it is made more desirable by the addition of any of the things that are good in themselves. What, then, is there that satisfies this criterion, which at the same time we can participate in? It is something of this sort that we are looking for. Those who object that that at which all things aim is not necessarily good are, we may surmise, talking nonsense. For we say that that which every one thinks really is so; and the man who attacks this belief will hardly have anything more credible to maintain instead. If it is senseless creatures that desire the things in question, there might be something in what they say; but if intelligent creatures

do so as well, what sense can there be in this view? But perhaps even in inferior creatures there is some natural good stronger than themselves which aims at their proper good.

Nor does the argument about the contrary of pleasure seem to be correct. They say that if pain is an evil it does not follow that pleasure is a good; for evil is opposed to evil and at the same time both are opposed to the neutral state – which is correct enough but does not apply to the things in question. For if both pleasure and pain belonged to the class of evils they ought both to be objects of aversion, while if they belonged to the class of neutrals neither should be an object of aversion or they should both be equally so; but in fact people evidently avoid the one as evil and choose the other as good; that then must be the nature of the opposition between them.

3

Nor again, if pleasure is not a quality, does it follow that it is not a good; for the activities of virtue are not qualities either, nor is happiness. They say, however, that the good is determinate, while pleasure is indeterminate, because it admits of degrees. Now if it is from the feeling of pleasure that they judge thus, the same will be true of justice and the other virtues, in respect of which we plainly say that people of a certain character are so more or less, and act more or less in accordance with these virtues; for people may be more just or brave, and it is possible also to act justly or temperately more or less. But if their judgement is based on the various pleasures, surely they are not stating the real cause, if in fact some pleasures are unmixed and others mixed. Again, just as health admits of degrees without being indeterminate, why should not pleasure? The

same proportion is not found in all things, nor a single proportion always in the same thing, but it may be relaxed and yet persist up to a point, and it may differ in degree. The case of pleasure also may therefore be of this kind.

Again, they assume that the good is perfect while movements and comings into being are imperfect, and try to exhibit pleasure as being a movement and a coming into being. But they do not seem to be right even in saying that it is a movement. For speed and slowness are thought to be proper to every movement, and if a movement, e.g. that of the heavens, has not speed or slowness in itself, it has it in relation to something else; but of pleasure neither of these things is true. For while we may become pleased quickly as we may become angry quickly, we cannot be pleased quickly, not even in relation to some one else, while we can walk, or grow, or the like, quickly. While, then, we can change quickly or slowly into a state of pleasure, we cannot quickly exhibit the activity of pleasure, i.e. be pleased. Again, how can it be a coming into being? It is not thought that any chance thing can come out of any chance thing, but that a thing is dissolved into that out of which it comes into being; and pain would be the destruction of that of which pleasure is the coming into being.

They say, too, that pain is the lack of that which is according to nature, and pleasure is replenishment. But these experiences are bodily. If then pleasure is replenishment with that which is according to nature, that which feels pleasure will be that in which the replenishment takes place, i.e. the body; but that is not thought to be the case; therefore the replenishment is not pleasure, though one would be pleased when replenishment was taking place, just as one would be pained if one was being operated on. This opinion seems to be based on the pains and pleasures connected with nutrition; on the fact that when people have been short of food and have felt pain beforehand

they are pleased by the replenishment. But this does not happen with all pleasures; for the pleasures of learning and, among the sensuous pleasures, those of smell, and also many sounds and sights, and memories and hopes, do not presuppose pain. Of what then will these be the coming into being? There has not been lack of anything of which they could be the supplying anew.

In reply to those who bring forward the disgraceful pleasures one may say that these are not pleasant; if things are pleasant to people of vicious constitution, we must not suppose that they are also pleasant to others than these, just as we do not reason so about the things that are wholesome or sweet or bitter to sick people, or ascribe whiteness to the things that seem white to those suffering from a disease of the eye. Or one might answer thus – that the pleasures are desirable, but not from these sources, as wealth is desirable, but not as the reward of betrayal, and health, but not at the cost of eating anything and everything. Or perhaps pleasures differ in kind; for those derived from noble sources are different from those derived from base sources, and one cannot the pleasure of the just man without being just, nor that of the musical man without being musical, and so on.

The fact, too, that a friend is different from a flatterer seems to make it plain that pleasure is not a good or that pleasures are different in kind; for the one is thought to consort with us with a view to the good, the other with a view to our pleasure, and the one is reproached for his conduct while the other is praised on the ground that he consorts with us for different ends. And no one would choose to live with the intellect of a child throughout his life, however much he were to be pleased at the things that children are pleased at, nor to get enjoyment by doing some most disgraceful deed, though he were never to feel any pain in consequence. And there are many things we should

be keen about even if they brought no pleasure, e.g. seeing, remembering, knowing, possessing the virtues. If pleasures necessarily do accompany these, that makes no odds; we should choose these even if no pleasure resulted. It seems to be clear, then, that neither is pleasure the good nor is all pleasure desirable, and that some pleasures are desirable in themselves, differing in kind or in their sources from the others. So much for the things that are said about pleasure and pain.

4

What pleasure is, or what kind of thing it is, will become plainer if we take up the question aga from the beginning. Seeing seems to be at any moment complete, for it does not lack anything which coming into being later will complete its form; and pleasure also seems to be of this nature. For it is a whole, and at no time can one find a pleasure whose form will be completed if the pleasure lasts longer. For this reason, too, it is not a movement. For every movement (e.g. that of building) takes time and is for the sake of an end, and is complete when it has made what it aims at. It is complete, therefore, only in the whole time or at that final moment. In their parts and during the time they occupy, all movements are incomplete, and are different in kind from the whole movement and from each other. For the fitting together of the stones is different from the fluting of the column, and these are both different from the making of the temple; and the making of the temple is complete (for it lacks nothing with a view to the end proposed), but the making of the base or of the triglyph is incomplete; for each is the making of only a part. They differ in kind, then, and it is not possible to find at any and every time a movement complete in form, but if at all, only in the whole time. So, too, in

the case of walking and all other movements. For if locomotion is a movement from to there, it, too, has differences in kind – flying, walking, leaping, and so on. And not only so, but in walking itself there are such differences; for the whence and whither are not the same in the whole racecourse and in a part of it, nor in one part and in another, nor is it the same thing to traverse this line and that; for one traverses not only a line but one which is in a place, and this one is in a different place from that. We have discussed movement with precision in another work, but it seems that it is not complete at any and every time, but that the many movements are incomplete and different in kind, since the whence and whither give them their form. But of pleasure the form is complete at any and every time. Plainly, then, pleasure and movement must be different from each other, and pleasure must be one of the things that are whole and complete. This would seem to be the case, too, from the fact that it is not possible to move otherwise than in time, but it is possible to be pleased; for that which takes place in a moment is a whole.

From these considerations it is clear, too, that these thinkers are not right in saying there is a movement or a coming into being of pleasure. For these cannot be ascribed to all things, but only to those that are divisible and not wholes; there is no coming into being of seeing nor of a point nor of a unit, nor is any of these a movement or coming into being; therefore there is no movement or coming into being of pleasure either; for it is a whole.

Since every sense is active in relation to its object, and a sense which is in good condition acts perfectly in relation to the most beautiful of its objects (for perfect activity seems to be ideally of this nature; whether we say that it is active, or the organ in which it resides, may be assumed to be immaterial), it follows that in the case of each sense the best activity is that of the

best-conditioned organ in relation to the finest of its objects. And this activity will be the most complete and pleasant. For, while there is pleasure in respect of any sense, and in respect of thought and contemplation no less, the most complete is pleasantest, and that of a well-conditioned organ in relation to the worthiest of its objects is the most complete; and the pleasure completes the activity. But the pleasure does not complete it in the same way as the combination of object and sense, both good, just as health and the doctor are not in the same way the cause of a man's being healthy. (That pleasure is produced in respect to each sense is plain; for we speak of sights and sounds as pleasant. It is also plain that it arises most of all when both the sense is at its best and it is active in reference to an object which corresponds; when both object and perceiver are of the best there will always be pleasure, since the requisite agent and patient are both present.) Pleasure completes the activity not as the corresponding permanent state does, by its immanence, but as an end which supervenes as the bloom of youth does on those in the flower of their age. So long, then, as both the intelligible or sensible object and the discriminating or contemplative faculty are as they should be, the pleasure will be involved in the activity; for when both the passive and the active factor are unchanged and are related to each other in the same way, the same result naturally follows.

How, then, is it that no one is continuously pleased? Is it that we grow weary? Certainly all human beings are incapable of continuous activity. Therefore pleasure also is not continuous; for it accompanies activity. Some things delight us when they are new, but later do so less, for the same reason; for at first the mind is in a state of stimulation and intensely active about them, as people are with respect to their vision when they look hard at a thing, but afterwards our activity is not of this kind, but has grown relaxed; for which reason the pleasure also is dulled.

One might think that all men desire pleasure because they all aim at life; life is an activity, and each man is active about those things and with those faculties that he loves most; e.g. the musician is active with his hearing in reference to tunes, the student with his mind in reference to theoretical questions, and so on in each case; now pleasure completes the activities, and therefore life, which they desire. It is with good reason, then, that they aim at pleasure too, since for every one it completes life, which is desirable. But whether we choose life for the sake of pleasure or pleasure for the sake of life is a question we may dismiss for the present. For they seem to be bound up together and not to admit of separation, since without activity pleasure does not arise, and every activity is completed by the attendant pleasure.

5

For this reason pleasures seem, too, to differ in kind. For things different in kind are, we think, completed by different things (we see this to be true both of natural objects and of things produced by art, e.g. animals, trees, a painting, a sculpture, a house, an implement); and, similarly, we think that activities differing in kind are completed by things differing in kind. Now the activities of thought differ from those of the senses, and both differ among themselves, in kind; so, therefore, do the pleasures that complete them.

This may be seen, too, from the fact that each of the pleasures is bound up with the activity it completes. For an activity is intensified by its proper pleasure, since each class of things is better judged of and brought to precision by those who engage in the activity with pleasure; e.g. it is those who enjoy

geometrical thinking that become geometers and grasp the various propositions better, and, similarly, those who are fond of music or of building, and so on, make progress in their proper function by enjoying it; so the pleasures intensify the activities, and what intensifies a thing is proper to it, but things different in kind have properties different in kind.

This will be even more apparent from the fact that activities are hindered by pleasures arising from other sources. For people who are fond of playing the flute are incapable of attending to arguments if they overhear some one playing the flute, since they enjoy flute-playing more than the activity in hand; so the pleasure connected with fluteplaying destroys the activity concerned with argument. This happens, similarly, in all other cases, when one is active about two things at once; the more pleasant activity drives out the other, and if it is much more pleasant does so all the more, so that one even ceases from the other. This is why when we enjoy anything very much we do not throw ourselves into anything else, and do one thing only when we are not much pleased by another; e.g. in the theatre the people who eat sweets do so most when the actors are poor. Now since activities are made precise and more enduring and better by their proper pleasure, and injured by alien pleasures, evidently the two kinds of pleasure are far apart. For alien pleasures do pretty much what proper pains do, since activities are destroyed by their proper pains; e.g. if a man finds writing or doing sums unpleasant and painful, he does not write, or does not do sums, because the activity is painful. So an activity suffers contrary effects from its proper pleasures and pains, i.e. from those that supervene on it in virtue of its own nature. And alien pleasures have been stated to do much the same as pain; they destroy the activity, only not to the same degree.

Now since activities differ in respect of goodness and badness, and some are worthy to be chosen, others to be avoided, and

others neutral, so, too, are the pleasures; for to each activity there is a proper pleasure. The pleasure proper to a worthy activity is good and that proper to an unworthy activity bad; just as the appetites for noble objects are laudable, those for base objects culpable. But the pleasures involved in activities are more proper to them than the desires; for the latter are separated both in time and in nature, while the former are close to the activities, and so hard to distinguish from them that it admits of dispute whether the activity is not the same as the pleasure. (Still, pleasure does not seem to be thought or perception – that would be strange; but because they are not found apart they appear to some people the same.) As activities are different, then, so are the corresponding pleasures. Now sight is superior to touch in purity, and hearing and smell to taste; the pleasures, therefore, are similarly superior, and those of thought superior to these, and within each of the two kinds some are superior to others.

Each animal is thought to have a proper pleasure, as it has a proper function; viz. that which corresponds to its activity. If we survey them species by species, too, this will be evident; horse, dog, and man have different pleasures, as Heraclitus says 'asses would prefer sweepings to gold'; for food is pleasanter than gold to asses. So the pleasures of creatures different in kind differ in kind, and it is plausible to suppose that those of a single species do not differ. But they vary to no small extent, in the case of men at least; the same things delight some people and pain others, and are painful and odious to some, and pleasant to and liked by others. This happens, too, in the case of sweet things; the same things do not seem sweet to a man in a fever and a healthy man – nor hot to a weak man and one in good condition. The same happens in other cases. But in all such matters that which appears to the good man is thought to be really so. If this is correct, as it seems to be, and virtue and the good man as such are the measure of each thing, those also will

be pleasures which appear so to him, and those things pleasant which he enjoys. If the things he finds tiresome seem pleasant to some one, that is nothing surprising; for men may be ruined and spoilt in many ways; but the things are not pleasant, but only pleasant to these people and to people in this condition. Those which are admittedly disgraceful plainly should not be said to be pleasures, except to a perverted taste; but of those that are thought to be good what kind of pleasure or what pleasure should be said to be that proper to man? Is it not plain from the corresponding activities? The pleasures follow these. Whether, then, the perfect and supremely happy man has one or more activities, the pleasures that perfect these will be said in the strict sense to be pleasures proper to man, and the rest will be so in a secondary and fractional way, as are the activities.

6

Now that we have spoken of the virtues, the forms of friendship, and the varieties of pleasure, what remains is to discuss in outline the nature of happiness, since this is what we state the end of human nature to be. Our discussion will be the more concise if we first sum up what we have said already. We said, then, that it is not a disposition; for if it were it might belong to some one who was asleep throughout his life, living the life of a plant, or, again, to some one who was suffering the greatest misfortunes. If these implications are unacceptable, and we must rather class happiness as an activity, as we have said before, and if some activities are necessary, and desirable for the sake of something else, while others are so in themselves, evidently happiness must be placed among those desirable in themselves, not among those desirable for the sake of

something else; for happiness does not lack anything, but is self-sufficient. Now those activities are desirable in themselves from which nothing is sought beyond the activity. And of this nature virtuous actions are thought to be; for to do noble and good deeds is a thing desirable for its own sake.

Pleasant amusements also are thought to be of this nature; we choose them not for the sake of other things; for we are injured rather than benefited by them, since we are led to neglect our bodies and our property. But most of the people who are deemed happy take refuge in such pastimes, which is the reason why those who are ready-witted at them are highly esteemed at the courts of tyrants; they make themselves pleasant companions in the tyrants' favourite pursuits, and that is the sort of man they want. Now these things are thought to be of the nature of happiness because people in despotic positions spend their leisure in them, but perhaps such people prove nothing; for virtue and reason, from which good activities flow, do not depend on despotic position; nor, if these people, who have never tasted pure and generous pleasure, take refuge in the bodily pleasures, should these for that reason be thought more desirable; for boys, too, think the things that are valued among themselves are the best. It is to be expected, then, that, as different things seem valuable to boys and to men, so they should to bad men and to good. Now, as we have often maintained, those things are both valuable and pleasant which are such to the good man; and to each man the activity in accordance with his own disposition is most desirable, and, therefore, to the good man that which is in accordance with virtue. Happiness, therefore, does not lie in amusement; it would, indeed, be strange if the end were amusement, and one were to take trouble and suffer hardship all one's life in order to amuse oneself. For, in a word, everything that we choose we choose for the sake of something else – except happiness, which is an end. Now to exert oneself and work for the sake of

amusement seems silly and utterly childish. But to amuse oneself in order that one may exert oneself, as Anacharsis puts it, seems right; for amusement is a sort of relaxation, and we need relaxation because we cannot work continuously. Relaxation, then, is not an end; for it is taken for the sake of activity.

The happy life is thought to be virtuous; now a virtuous life requires exertion, and does not consist in amusement. And we say that serious things are better than laughable things and those connected with amusement, and that the activity of the better of any two things – whether it be two elements of our being or two men – is the more serious; but the activity of the better is ipso facto superior and more of the nature of happiness. And any chance person – even a slave – can enjoy the bodily pleasures no less than the best man; but no one assigns to a slave a share in happiness – unless he assigns to him also a share in human life. For happiness does not lie in such occupations, but, as we have said before, in virtuous activities.

7

If happiness is activity in accordance with virtue, it is reasonable that it should be in accordance with the highest virtue; and this will be that of the best thing in us. Whether it be reason or something else that is this element which is thought to be our natural ruler and guide and to take thought of things noble and divine, whether it be itself also divine or only the most divine element in us, the activity of this in accordance with its proper virtue will be perfect happiness. That this activity is contemplative we have already said.

Now this would seem to be in agreement both with what we said before and with the truth. For, firstly, this activity is the best (since not only is reason the best thing in us, but the objects of reason are the best of knowable objects); and secondly, it is the most continuous, since we can contemplate truth more continuously than we can do anything. And we think happiness has pleasure mingled with it, but the activity of philosophic wisdom is admittedly the pleasantest of virtuous activities; at all events the pursuit of it is thought to offer pleasures marvellous for their purity and their enduringness, and it is to be expected that those who know will pass their time more pleasantly than those who inquire. And the self-sufficiency that is spoken of must belong most to the contemplative activity. For while a philosopher, as well as a just man or one possessing any other virtue, needs the necessaries of life, when they are sufficiently equipped with things of that sort the just man needs people towards whom and with whom he shall act justly, and the temperate man, the brave man, and each of the others is in the same case, but the philosopher, even when by himself, can contemplate truth, and the better the wiser he is; he can perhaps do so better if he has fellow-workers, but still he is the most self-sufficient. And this activity alone would seem to be loved for its own sake; for nothing arises from it apart from the contemplating, while from practical activities we gain more or less apart from the action. And happiness is thought to depend on leisure; for we are busy that we may have leisure, and make war that we may live in peace. Now the activity of the practical virtues is exhibited in political or military affairs, but the actions concerned with these seem to be unleisurely. Warlike actions are completely so (for no one chooses to be at war, or provokes war, for the sake of being at war; any one would seem absolutely murderous if he were to make enemies of his friends in order to bring about battle and slaughter); but the action of the statesman is also

unleisurely, and – apart from the political action itself – aims at despotic power and honours, or at all events happiness, for him and his fellow citizens – a happiness different from political action, and evidently sought as being different. So if among virtuous actions political and military actions are distinguished by nobility and greatness, and these are unleisurely and aim at an end and are not desirable for their own sake, but the activity of reason, which is contemplative, seems both to be superior in serious worth and to aim at no end beyond itself, and to have its pleasure proper to itself (and this augments the activity), and the self-sufficiency, leisureliness, unweariedness (so far as this is possible for man), and all the other attributes ascribed to the supremely happy man are evidently those connected with this activity, it follows that this will be the complete happiness of man, if it be allowed a complete term of life (for none of the attributes of happiness is incomplete).

But such a life would be too high for man; for it is not in so far as he is man that he will live so, but in so far as something divine is present in him; and by so much as this is superior to our composite nature is its activity superior to that which is the exercise of the other kind of virtue. If reason is divine, then, in comparison with man, the life according to it is divine in comparison with human life. But we must not follow those who advise us, being men, to think of human things, and, being mortal, of mortal things, but must, so far as we can, make ourselves immortal, and strain every nerve to live in accordance with the best thing in us; for even if it be small in bulk, much more does it in power and worth surpass everything. This would seem, too, to be each man himself, since it is the authoritative and better part of him. It would be strange, then, if he were to choose not the life of his self but that of something else. And what we said before' will apply now; that which is proper to each thing is by nature best and most pleasant for each thing; for man, therefore, the life according to reason is best and

pleasantest, since reason more than anything else is man. This life therefore is also the happiest.

8

But in a secondary degree the life in accordance with the other kind of virtue is happy; for the activities in accordance with this befit our human estate. Just and brave acts, and other virtuous acts, we do in relation to each other, observing our respective duties with regard to contracts and services and all manner of actions and with regard to passions; and all of these seem to be typically human. Some of them seem even to arise from the body, and virtue of character to be in many ways bound up with the passions. Practical wisdom, too, is linked to virtue of character, and this to practical wisdom, since the principles of practical wisdom are in accordance with the moral virtues and rightness in morals is in accordance with practical wisdom. Being connected with the passions also, the moral virtues must belong to our composite nature; and the virtues of our composite nature are human; so, therefore, are the life and the happiness which correspond to these. The excellence of the reason is a thing apart; we must be content to say this much about it, for to describe it precisely is a task greater than our purpose requires. It would seem, however, also to need external equipment but little, or less than moral virtue does. Grant that both need the necessaries, and do so equally, even if the statesman's work is the more concerned with the body and things of that sort; for there will be little difference there; but in what they need for the exercise of their activities there will be much difference. The liberal man will need money for the doing of his liberal deeds, and the just man too will need it for the returning of services (for wishes are hard to discern, and even

people who are not just pretend to wish to act justly); and the brave man will need power if he is to accomplish any of the acts that correspond to his virtue, and the temperate man will need opportunity; for how else is either he or any of the others to be recognized? It is debated, too, whether the will or the deed is more essential to virtue, which is assumed to involve both; it is surely clear that its perfection involves both; but for deeds many things are needed, and more, the greater and nobler the deeds are. But the man who is contemplating the truth needs no such thing, at least with a view to the exercise of his activity; indeed they are, one may say, even hindrances, at all events to his contemplation; but in so far as he is a man and lives with a number of people, he chooses to do virtuous acts; he will therefore need such aids to living a human life.

But that perfect happiness is a contemplative activity will appear from the following consideration as well. We assume the gods to be above all other beings blessed and happy; but what sort of actions must we assign to them? Acts of justice? Will not the gods seem absurd if they make contracts and return deposits, and so on? Acts of a brave man, then, confronting dangers and running risks because it is noble to do so? Or liberal acts? To whom will they give? It will be strange if they are really to have money or anything of the kind. And what would their temperate acts be? Is not such praise tasteless, since they have no bad appetites? If we were to run through them all, the circumstances of action would be found trivial and unworthy of gods. Still, every one supposes that they live and therefore that they are active; we cannot suppose them to sleep like Endymion. Now if you take away from a living being action, and still more production, what is left but contemplation? Therefore the activity of God, which surpasses all others in blessedness, must be contemplative; and of human activities, therefore, that which is most akin to this must be most of the nature of happiness.

This is indicated, too, by the fact that the other animals have no share in happiness, being completely deprived of such activity. For while the whole life of the gods is blessed, and that of men too in so far as some likeness of such activity belongs to them, none of the other animals is happy, since they in no way share in contemplation. Happiness extends, then, just so far as contemplation does, and those to whom contemplation more fully belongs are more truly happy, not as a mere concomitant but in virtue of the contemplation; for this is in itself precious. Happiness, therefore, must be some form of contemplation.

But, being a man, one will also need external prosperity; for our nature is not self-sufficient for the purpose of contemplation, but our body also must be healthy and must have food and other attention. Still, we must not think that the man who is to be happy will need many things or great things, merely because he cannot be supremely happy without external goods; for self-sufficiency and action do not involve excess, and we can do noble acts without ruling earth and sea; for even with moderate advantages one can act virtuously (this is manifest enough; for private persons are thought to do worthy acts no less than despots – indeed even more); and it is enough that we should have so much as that; for the life of the man who is active in accordance with virtue will be happy. Solon, too, was perhaps sketching well the happy man when he described him as moderately furnished with externals but as having done (as Solon thought) the noblest acts, and lived temperately; for one can with but moderate possessions do what one ought. Anaxagoras also seems to have supposed the happy man not to be rich nor a despot, when he said that he would not be surprised if the happy man were to seem to most people a strange person; for they judge by externals, since these are all they perceive. The opinions of the wise seem, then, to harmonize with our arguments. But while even such things carry some conviction, the truth in practical matters is

discerned from the facts of life; for these are the decisive factor. We must therefore survey what we have already said, bringing it to the test of the facts of life, and if it harmonizes with the facts we must accept it, but if it clashes with them we must suppose it to be mere theory. Now he who exercises his reason and cultivates it seems to be both in the best state of mind and most dear to the gods. For if the gods have any care for human affairs, as they are thought to have, it would be reasonable both that they should delight in that which was best and most akin to them (i.e. reason) and that they should reward those who love and honour this most, as caring for the things that are dear to them and acting both rightly and nobly. And that all these attributes belong most of all to the philosopher is manifest. He, therefore, is the dearest to the gods. And he who is that will presumably be also the happiest; so that in this way too the philosopher will more than any other be happy.

9

If these matters and the virtues, and also friendship and pleasure, have been dealt with sufficiently in outline, are we to suppose that our programme has reached its end? Surely, as the saying goes, where there are things to be done the end is not to survey and recognize the various things, but rather to do them; with regard to virtue, then, it is not enough to know, but we must try to have and use it, or try any other way there may be of becoming good. Now if arguments were in themselves enough to make men good, they would justly, as Theognis says, have won very great rewards, and such rewards should have been provided; but as things are, while they seem to have power to encourage and stimulate the generous-minded among our youth, and to make a character which is gently born, and a true

lover of what is noble, ready to be possessed by virtue, they are not able to encourage the many to nobility and goodness. For these do not by nature obey the sense of shame, but only fear, and do not abstain from bad acts because of their baseness but through fear of punishment; living by passion they pursue their own pleasures and the means to them, and and the opposite pains, and have not even a conception of what is noble and truly pleasant, since they have never tasted it. What argument would remould such people? It is hard, if not impossible, to remove by argument the traits that have long since been incorporated in the character; and perhaps we must be content if, when all the influences by which we are thought to become good are present, we get some tincture of virtue.

Now some think that we are made good by nature, others by habituation, others by teaching. Nature's part evidently does not depend on us, but as a result of some divine causes is present in those who are truly fortunate; while argument and teaching, we may suspect, are not powerful with all men, but the soul of the student must first have been cultivated by means of habits for noble joy and noble hatred, like earth which is to nourish the seed. For he who lives as passion directs will not hear argument that dissuades him, nor understand it if he does; and how can we persuade one in such a state to change his ways? And in general passion seems to yield not to argument but to force. The character, then, must somehow be there already with a kinship to virtue, loving what is noble and hating what is base.

But it is difficult to get from youth up a right training for virtue if one has not been brought up under right laws; for to live temperately and hardily is not pleasant to most people, especially when they are young. For this reason their nurture and occupations should be fixed by law; for they will not be painful when they have become customary. But it is surely not enough that when they are young they should get the right

nurture and attention; since they must, even when they are grown up, practise and be habituated to them, we shall need laws for this as well, and generally speaking to cover the whole of life; for most people obey necessity rather than argument, and punishments rather than the sense of what is noble.

This is why some think that legislators ought to stimulate men to virtue and urge them forward by the motive of the noble, on the assumption that those who have been well advanced by the formation of habits will attend to such influences; and that punishments and penalties should be imposed on those who disobey and are of inferior nature, while the incurably bad should be completely banished. A good man (they think), since he lives with his mind fixed on what is noble, will submit to argument, while a bad man, whose desire is for pleasure, is corrected by pain like a beast of burden. This is, too, why they say the pains inflicted should be those that are most opposed to the pleasures such men love.

However that may be, if (as we have said) the man who is to be good must be well trained and habituated, and go on to spend his time in worthy occupations and neither willingly nor unwillingly do bad actions, and if this can be brought about if men live in accordance with a sort of reason and right order, provided this has force, – if this be so, the paternal command indeed has not the required force or compulsive power (nor in general has the command of one man, unless he be a king or something similar), but the law has compulsive power, while it is at the same time a rule proceeding from a sort of practical wisdom and reason. And while people hate men who oppose their impulses, even if they oppose them rightly, the law in its ordaining of what is good is not burdensome.

In the Spartan state alone, or almost alone, the legislator seems to have paid attention to questions of nurture and occupations;

in most states such matters have been neglected, and each man lives as he pleases, Cyclops-fashion, ‘to his own wife and children dealing law’. Now it is best that there should be a public and proper care for such matters; but if they are neglected by the community it would seem right for each man to help his children and friends towards virtue, and that they should have the power, or at least the will, to do this.

It would seem from what has been said that he can do this better if he makes himself capable of legislating. For public control is plainly effected by laws, and good control by good laws; whether written or unwritten would seem to make no difference, nor whether they are laws providing for the education of individuals or of groups – any more than it does in the case of music or gymnastics and other such pursuits. For as in cities laws and prevailing types of character have force, so in households do the injunctions and the habits of the father, and these have even more because of the tie of blood and the benefits he confers; for the children start with a natural affection and disposition to obey. Further, private education has an advantage over public, as private medical treatment has; for while in general rest and abstinence from food are good for a man in a fever, for a particular man they may not be; and a boxer presumably does not prescribe the same style of fighting to all his pupils. It would seem, then, that the detail is worked out with more precision if the control is private; for each person is more likely to get what suits his case.

But the details can be best looked after, one by one, by a doctor or gymnastic instructor or any one else who has the general knowledge of what is good for every one or for people of a certain kind (for the sciences both are said to be, and are, concerned with what is universal); not but what some particular detail may perhaps be well looked after by an unscientific person, if he has studied accurately in the light of experience

what happens in each case, just as some people seem to be their own best doctors, though they could give no help to any one else. None the less, it will perhaps be agreed that if a man does wish to become master of an art or science he must go to the universal, and come to know it as well as possible; for, as we have said, it is with this that the sciences are concerned.

And surely he who wants to make men, whether many or few, better by his care must try to become capable of legislating, if it is through laws that we can become good. For to get any one whatever – any one who is put before us – into the right condition is not for the first chance comer; if any one can do it, it is the man who knows, just as in medicine and all other matters which give scope for care and prudence.

Must we not, then, next examine whence or how one can learn how to legislate? Is it, as in all other cases, from statesmen? Certainly it was thought to be a part of statesmanship. Or is a difference apparent between statesmanship and the other sciences and arts? In the others the same people are found offering to teach the arts and practising them, e.g. doctors or painters; but while the sophists profess to teach politics, it is practised not by any of them but by the politicians, who would seem to do so by dint of a certain skill and experience rather than of thought; for they are not found either writing or speaking about such matters (though it were a nobler occupation perhaps than composing speeches for the law-courts and the assembly), nor again are they found to have made statesmen of their own sons or any other of their friends. But it was to be expected that they should if they could; for there is nothing better than such a skill that they could have left to their cities, or could prefer to have for themselves, or, therefore, for those dearest to them. Still, experience seems to contribute not a little; else they could not have become politicians by familiarity with politics; and so it seems that

those who aim at knowing about the art of politics need experience as well.

But those of the sophists who profess the art seem to be very far from teaching it. For, to put the matter generally, they do not even know what kind of thing it is nor what kinds of things it is about; otherwise they would not have classed it as identical with rhetoric or even inferior to it, nor have thought it easy to legislate by collecting the laws that are thought well of; they say it is possible to select the best laws, as though even the selection did not demand intelligence and as though right judgement were not the greatest thing, as in matters of music. For while people experienced in any department judge rightly the works produced in it, and understand by what means or how they are achieved, and what harmonizes with what, the inexperienced must be content if they do not fail to see whether the work has been well or ill made – as in the case of painting. Now laws are as it were the' works' of the political art; how then can one learn from them to be a legislator, or judge which are best? Even medical men do not seem to be made by a study of text-books. Yet people try, at any rate, to state not only the treatments, but also how particular classes of people can be cured and should be treated – distinguishing the various habits of body; but while this seems useful to experienced people, to the inexperienced it is valueless. Surely, then, while collections of laws, and of constitutions also, may be serviceable to those who can study them and judge what is good or bad and what enactments suit what circumstances, those who go through such collections without a practised faculty will not have right judgement (unless it be as a spontaneous gift of nature), though they may perhaps become more intelligent in such matters.

Now our predecessors have left the subject of legislation to us unexamined; it is perhaps best, therefore, that we should ourselves study it, and in general study the question of the

constitution, in order to complete to the best of our ability our philosophy of human nature. First, then, if anything has been said well in detail by earlier thinkers, let us try to review it; then in the light of the constitutions we have collected let us study what sorts of influence preserve and destroy states, and what sorts preserve or destroy the particular kinds of constitution, and to what causes it is due that some are well and others ill administered. When these have been studied we shall perhaps be more likely to see with a comprehensive view, which constitution is best, and how each must be ordered, and what laws and customs it must use, if it is to be at its best. Let us make a beginning of our discussion.

Aristotle – Politics

[Translated by Benjamin Jowett]

Book I

1

Every state is a community of some kind, and every community is established with a view to some good; for mankind always act in order to obtain that which they think good. But, if all communities aim at some good, the state or political community, which is the highest of all, and which embraces all the rest, aims at good in a greater degree than any other, and at the highest good.

Some people think that the qualifications of a statesman, king, householder, and master are the same, and that they differ, not in kind, but only in the number of their subjects. For example, the ruler over a few is called a master; over more, the manager of a household; over a still larger number, a statesman or king, as if there were no difference between a great household and a small state. The distinction which is made between the king and the statesman is as follows: When the government is personal, the ruler is a king; when, according to the rules of the political science, the citizens rule and are ruled in turn, then he is called a statesman.

But all this is a mistake; for governments differ in kind, as will be evident to any one who considers the matter according to the method which has hitherto guided us. As in other departments of science, so in politics, the compound should

always be resolved into the simple elements or least parts of the whole. We must therefore look at the elements of which the state is composed, in order that we may see in what the different kinds of rule differ from one another, and whether any scientific result can be attained about each one of them.

2

He who thus considers things in their first growth and origin, whether a state or anything else, will obtain the clearest view of them. In the first place there must be a union of those who cannot exist without each other; namely, of male and female, that the race may continue (and this is a union which is formed, not of deliberate purpose, but because, in common with other animals and with plants, mankind have a natural desire to leave behind them an image of themselves), and of natural ruler and subject, that both may be preserved. For that which can foresee by the exercise of mind is by nature intended to be lord and master, and that which can with its body give effect to such foresight is a subject, and by nature a slave; hence master and slave have the same interest. Now nature has distinguished between the female and the slave. For she is not niggardly, like the smith who fashions the Delphian knife for many uses; she makes each thing for a single use, and every instrument is best made when intended for one and not for many uses. But among barbarians no distinction is made between women and slaves, because there is no natural ruler among them: they are a community of slaves, male and female. Wherefore the poets say,

It is meet that Hellenes should rule over barbarians;

as if they thought that the barbarian and the slave were by nature one.

Out of these two relationships between man and woman, master and slave, the first thing to arise is the family, and Hesiod is right when he says,

First house and wife and an ox for the plough,

for the ox is the poor man's slave. The family is the association established by nature for the supply of men's everyday wants, and the members of it are called by Charondas 'companions of the cupboard,' and by Epimenides the Cretan, 'companions of the manger.' But when several families are united, and the association aims at something more than the supply of daily needs, the first society to be formed is the village. And the most natural form of the village appears to be that of a colony from the family, composed of the children and grandchildren, who are said to be suckled 'with the same milk.' And this is the reason why Hellenic states were originally governed by kings; because the Hellenes were under royal rule before they came together, as the barbarians still are. Every family is ruled by the eldest, and therefore in the colonies of the family the kingly form of government prevailed because they were of the same blood. As Homer says:

Each one gives law to his children and to his wives.

For they lived dispersedly, as was the manner in ancient times. Wherefore men say that the Gods have a king, because they themselves either are or were in ancient times under the rule of a king. For they imagine, not only the forms of the Gods, but their ways of life to be like their own.

When several villages are united in a single complete community, large enough to be nearly or quite self-sufficing, the state comes into existence, originating in the bare needs of life, and continuing in existence for the sake of a good life. And therefore, if the earlier forms of society are natural, so is the

state, for it is the end of them, and the nature of a thing is its end. For what each thing is when fully developed, we call its nature, whether we are speaking of a man, a horse, or a family. Besides, the final cause and end of a thing is the best, and to be self-sufficing is the end and the best.

Hence it is evident that the state is a creation of nature, and that man is by nature a political animal. And he who by nature and not by mere accident is without a state, is either a bad man or above humanity; he is like the

Tribeless, lawless, hearthless one,

whom Homer denounces – the natural outcast is forthwith a lover of war; he may be compared to an isolated piece at draughts.

Now, that man is more of a political animal than bees or any other gregarious animals is evident. Nature, as we often say, makes nothing in vain, and man is the only animal whom she has endowed with the gift of speech. And whereas mere voice is but an indication of pleasure or pain, and is therefore found in other animals (for their nature attains to the perception of pleasure and pain and the intimation of them to one another, and no further), the power of speech is intended to set forth the expedient and inexpedient, and therefore likewise the just and the unjust. And it is a characteristic of man that he alone has any sense of good and evil, of just and unjust, and the like, and the association of living beings who have this sense makes a family and a state.

Further, the state is by nature clearly prior to the family and to the individual, since the whole is of necessity prior to the part; for example, if the whole body be destroyed, there will be no foot or hand, except in an equivocal sense, as we might speak of a stone hand; for when destroyed the hand will be no better

than that. But things are defined by their working and power; and we ought not to say that they are the same when they no longer have their proper quality, but only that they have the same name. The proof that the state is a creation of nature and prior to the individual is that the individual, when isolated, is not self-sufficing; and therefore he is like a part in relation to the whole. But he who is unable to live in society, or who has no need because he is sufficient for himself, must be either a beast or a god: he is no part of a state. A social instinct is implanted in all men by nature, and yet he who first founded the state was the greatest of benefactors. For man, when perfected, is the best of animals, but, when separated from law and justice, he is the worst of all; since armed injustice is the more dangerous, and he is equipped at birth with arms, meant to be used by intelligence and virtue, which he may use for the worst ends. Wherefore, if he have not virtue, he is the most unholy and the most savage of animals, and the most full of lust and gluttony. But justice is the bond of men in states, for the administration of justice, which is the determination of what is just, is the principle of order in political society.

3

Seeing then that the state is made up of households, before speaking of the state we must speak of the management of the household. The parts of household management correspond to the persons who compose the household, and a complete household consists of slaves and freemen. Now we should begin by examining everything in its fewest possible elements; and the first and fewest possible parts of a family are master and slave, husband and wife, father and children. We have therefore to consider what each of these three relations is and ought to

be: I mean the relation of master and servant, the marriage relation (the conjunction of man and wife has no name of its own), and thirdly, the procreative relation (this also has no proper name). And there is another element of a household, the so-called art of getting wealth, which, according to some, is identical with household management, according to others, a principal part of it; the nature of this art will also have to be considered by us.

Let us first speak of master and slave, looking to the needs of practical life and also seeking to attain some better theory of their relation than exists at present. For some are of opinion that the rule of a master is a science, and that the management of a household, and the mastership of slaves, and the political and royal rule, as I was saying at the outset, are all the same. Others affirm that the rule of a master over slaves is contrary to nature, and that the distinction between slave and freeman exists by law only, and not by nature; and being an interference with nature is therefore unjust.

4

Property is a part of the household, and the art of acquiring property is a part of the art of managing the household; for no man can live well, or indeed live at all, unless he be provided with necessaries. And as in the arts which have a definite sphere the workers must have their own proper instruments for the accomplishment of their work, so it is in the management of a household. Now instruments are of various sorts; some are living, others lifeless; in the rudder, the pilot of a ship has a lifeless, in the look-out man, a living instrument; for in the arts the servant is a kind of instrument. Thus, too, a possession is an

instrument for maintaining life. And so, in the arrangement of the family, a slave is a living possession, and property a number of such instruments; and the servant is himself an instrument which takes precedence of all other instruments. For if every instrument could accomplish its own work, obeying or anticipating the will of others, like the statues of Daedalus, or the tripods of Hephaestus, which, says the poet,

of their own accord entered the assembly of the Gods;

if, in like manner, the shuttle would weave and the plectrum touch the lyre without a hand to guide them, chief workmen would not want servants, nor masters slaves. Here, however, another distinction must be drawn; the instruments commonly so called are instruments of production, whilst a possession is an instrument of action. The shuttle, for example, is not only of use; but something else is made by it, whereas of a garment or of a bed there is only the use. Further, as production and action are different in kind, and both require instruments, the instruments which they employ must likewise differ in kind. But life is action and not production, and therefore the slave is the minister of action. Again, a possession is spoken of as a part is spoken of; for the part is not only a part of something else, but wholly belongs to it; and this is also true of a possession. The master is only the master of the slave; he does not belong to him, whereas the slave is not only the slave of his master, but wholly belongs to him. Hence we see what is the nature and office of a slave; he who is by nature not his own but another's man, is by nature a slave; and he may be said to be another's man who, being a human being, is also a possession. And a possession may be defined as an instrument of action, separable from the possessor.

5

But is there any one thus intended by nature to be a slave, and for whom such a condition is expedient and right, or rather is not all slavery a violation of nature?

There is no difficulty in answering this question, on grounds both of reason and of fact. For that some should rule and others be ruled is a thing not only necessary, but expedient; from the hour of their birth, some are marked out for subjection, others for rule.

And there are many kinds both of rulers and subjects (and that rule is the better which is exercised over better subjects – for example, to rule over men is better than to rule over wild beasts; for the work is better which is executed by better workmen, and where one man rules and another is ruled, they may be said to have a work); for in all things which form a composite whole and which are made up of parts, whether continuous or discrete, a distinction between the ruling and the subject element comes to fight. Such a duality exists in living creatures, but not in them only; it originates in the constitution of the universe; even in things which have no life there is a ruling principle, as in a musical mode. But we are wandering from the subject. We will therefore restrict ourselves to the living creature, which, in the first place, consists of soul and body: and of these two, the one is by nature the ruler, and the other the subject. But then we must look for the intentions of nature in things which retain their nature, and not in things which are corrupted. And therefore we must study the man who is in the most perfect state both of body and soul, for in him we shall see the true relation of the two; although in bad or corrupted natures the body will often appear to rule over the soul, because they are in an evil and unnatural condition. At all events we may firstly observe in living creatures both a

despotical and a constitutional rule; for the soul rules the body with a despotical rule, whereas the intellect rules the appetites with a constitutional and royal rule. And it is clear that the rule of the soul over the body, and of the mind and the rational element over the passionate, is natural and expedient; whereas the equality of the two or the rule of the inferior is always hurtful. The same holds good of animals in relation to men; for tame animals have a better nature than wild, and all tame animals are better off when they are ruled by man; for then they are preserved. Again, the male is by nature superior, and the female inferior; and the one rules, and the other is ruled; this principle, of necessity, extends to all mankind.

Where then there is such a difference as that between soul and body, or between men and animals (as in the case of those whose business is to use their body, and who can do nothing better), the lower sort are by nature slaves, and it is better for them as for all inferiors that they should be under the rule of a master. For he who can be, and therefore is, another's and he who participates in rational principle enough to apprehend, but not to have, such a principle, is a slave by nature. Whereas the lower animals cannot even apprehend a principle; they obey their instincts. And indeed the use made of slaves and of tame animals is not very different; for both with their bodies minister to the needs of life. Nature would like to distinguish between the bodies of freemen and slaves, making the one strong for servile labor, the other upright, and although useless for such services, useful for political life in the arts both of war and peace. But the opposite often happens – that some have the souls and others have the bodies of freemen. And doubtless if men differed from one another in the mere forms of their bodies as much as the statues of the Gods do from men, all would acknowledge that the inferior class should be slaves of the superior. And if this is true of the body, how much more just that a similar distinction should exist in the soul? but the

beauty of the body is seen, whereas the beauty of the soul is not seen. It is clear, then, that some men are by nature free, and others slaves, and that for these latter slavery is both expedient and right.

6

But that those who take the opposite view have in a certain way right on their side, may be easily seen. For the words slavery and slave are used in two senses. There is a slave or slavery by law as well as by nature. The law of which I speak is a sort of convention – the law by which whatever is taken in war is supposed to belong to the victors. But this right many jurists impeach, as they would an orator who brought forward an unconstitutional measure: they detest the notion that, because one man has the power of doing violence and is superior in brute strength, another shall be his slave and subject. Even among philosophers there is a difference of opinion. The origin of the dispute, and what makes the views invade each other's territory, is as follows: in some sense virtue, when furnished with means, has actually the greatest power of exercising force; and as superior power is only found where there is superior excellence of some kind, power seems to imply virtue, and the dispute to be simply one about justice (for it is due to one party identifying justice with goodwill while the other identifies it with the mere rule of the stronger). If these views are thus set out separately, the other views have no force or plausibility against the view that the superior in virtue ought to rule, or be master. Others, clinging, as they think, simply to a principle of justice (for law and custom are a sort of justice), assume that slavery in accordance with the custom of war is justified by law, but at the same moment they deny this. For what if the cause of

the war be unjust? And again, no one would ever say he is a slave who is unworthy to be a slave. Were this the case, men of the highest rank would be slaves and the children of slaves if they or their parents chance to have been taken captive and sold. Wherefore Hellenes do not like to call Hellenes slaves, but confine the term to barbarians. Yet, in using this language, they really mean the natural slave of whom we spoke at first; for it must be admitted that some are slaves everywhere, others nowhere. The same principle applies to nobility. Hellenes regard themselves as noble everywhere, and not only in their own country, but they deem the barbarians noble only when at home, thereby implying that there are two sorts of nobility and freedom, the one absolute, the other relative. The Helen of Theodectes says:

Who would presume to call me servant who am on both sides sprung from the stem of the Gods?

What does this mean but that they distinguish freedom and slavery, noble and humble birth, by the two principles of good and evil? They think that as men and animals beget men and animals, so from good men a good man springs. But this is what nature, though she may intend it, cannot always accomplish.

We see then that there is some foundation for this difference of opinion, and that all are not either slaves by nature or freemen by nature, and also that there is in some cases a marked distinction between the two classes, rendering it expedient and right for the one to be slaves and the others to be masters: the one practicing obedience, the others exercising the authority and lordship which nature intended them to have. The abuse of this authority is injurious to both; for the interests of part and whole, of body and soul, are the same, and the slave is a part of the master, a living but separated part of his bodily frame. Hence, where the relation of master and slave between them is

natural they are friends and have a common interest, but where it rests merely on law and force the reverse is true.

7

The previous remarks are quite enough to show that the rule of a master is not a constitutional rule, and that all the different kinds of rule are not, as some affirm, the same with each other. For there is one rule exercised over subjects who are by nature free, another over subjects who are by nature slaves. The rule of a household is a monarchy, for every house is under one head: whereas constitutional rule is a government of freemen and equals. The master is not called a master because he has science, but because he is of a certain character, and the same remark applies to the slave and the freeman. Still there may be a science for the master and science for the slave. The science of the slave would be such as the man of Syracuse taught, who made money by instructing slaves in their ordinary duties. And such a knowledge may be carried further, so as to include cookery and similar menial arts. For some duties are of the more necessary, others of the more honorable sort; as the proverb says, 'slave before slave, master before master.' But all such branches of knowledge are servile. There is likewise a science of the master, which teaches the use of slaves; for the master as such is concerned, not with the acquisition, but with the use of them. Yet this so-called science is not anything great or wonderful; for the master need only know how to order that which the slave must know how to execute. Hence those who are in a position which places them above toil have stewards who attend to their households while they occupy themselves with philosophy or with politics. But the art of acquiring slaves, I mean of justly acquiring them, differs both from the art of the

master and the art of the slave, being a species of hunting or war. Enough of the distinction between master and slave.

8

Let us now inquire into property generally, and into the art of getting wealth, in accordance with our usual method, for a slave has been shown to be a part of property. The first question is whether the art of getting wealth is the same with the art of managing a household or a part of it, or instrumental to it; and if the last, whether in the way that the art of making shuttles is instrumental to the art of weaving, or in the way that the casting of bronze is instrumental to the art of the statuary, for they are not instrumental in the same way, but the one provides tools and the other material; and by material I mean the substratum out of which any work is made; thus wool is the material of the weaver, bronze of the statuary. Now it is easy to see that the art of household management is not identical with the art of getting wealth, for the one uses the material which the other provides. For the art which uses household stores can be no other than the art of household management. There is, however, a doubt whether the art of getting wealth is a part of household management or a distinct art. If the getter of wealth has to consider whence wealth and property can be procured, but there are many sorts of property and riches, then are husbandry, and the care and provision of food in general, parts of the wealth-getting art or distinct arts? Again, there are many sorts of food, and therefore there are many kinds of lives both of animals and men; they must all have food, and the differences in their food have made differences in their ways of life. For of beasts, some are gregarious, others are solitary; they live in the way which is best adapted to sustain them, accordingly as they

are carnivorous or herbivorous or omnivorous: and their habits are determined for them by nature in such a manner that they may obtain with greater facility the food of their choice. But, as different species have different tastes, the same things are not naturally pleasant to all of them; and therefore the lives of carnivorous or herbivorous animals further differ among themselves. In the lives of men too there is a great difference. The laziest are shepherds, who lead an idle life, and get their subsistence without trouble from tame animals; their flocks having to wander from place to place in search of pasture, they are compelled to follow them, cultivating a sort of living farm. Others support themselves by hunting, which is of different kinds. Some, for example, are brigands, others, who dwell near lakes or marshes or rivers or a sea in which there are fish, are fishermen, and others live by the pursuit of birds or wild beasts. The greater number obtain a living from the cultivated fruits of the soil. Such are the modes of subsistence which prevail among those whose industry springs up of itself, and whose food is not acquired by exchange and retail trade – there is the shepherd, the husbandman, the brigand, the fisherman, the hunter. Some gain a comfortable maintenance out of two employments, eking out the deficiencies of one of them by another: thus the life of a shepherd may be combined with that of a brigand, the life of a farmer with that of a hunter. Other modes of life are similarly combined in any way which the needs of men may require. Property, in the sense of a bare livelihood, seems to be given by nature herself to all, both when they are first born, and when they are grown up. For some animals bring forth, together with their offspring, so much food as will last until they are able to supply themselves; of this the vermiparous or oviparous animals are an instance; and the viviparous animals have up to a certain time a supply of food for their young in themselves, which is called milk. In like manner we may infer that, after the birth of animals, plants

exist for their sake, and that the other animals exist for the sake of man, the tame for use and food, the wild, if not all at least the greater part of them, for food, and for the provision of clothing and various instruments. Now if nature makes nothing incomplete, and nothing in vain, the inference must be that she has made all animals for the sake of man. And so, in one point of view, the art of war is a natural art of acquisition, for the art of acquisition includes hunting, an art which we ought to practice against wild beasts, and against men who, though intended by nature to be governed, will not submit; for war of such a kind is naturally just.

Of the art of acquisition then there is one kind which by nature is a part of the management of a household, in so far as the art of household management must either find ready to hand, or itself provide, such things necessary to life, and useful for the community of the family or state, as can be stored. They are the elements of true riches; for the amount of property which is needed for a good life is not unlimited, although Solon in one of his poems says that

No bound to riches has been fixed for man.

But there is a boundary fixed, just as there is in the other arts; for the instruments of any art are never unlimited, either in number or size, and riches may be defined as a number of instruments to be used in a household or in a state. And so we see that there is a natural art of acquisition which is practiced by managers of households and by statesmen, and what is the reason of this.

9

There is another variety of the art of acquisition which is commonly and rightly called an art of wealth-getting, and has in fact suggested the notion that riches and property have no limit. Being nearly connected with the preceding, it is often identified with it. But though they are not very different, neither are they the same. The kind already described is given by nature, the other is gained by experience and art.

Let us begin our discussion of the question with the following considerations:

Of everything which we possess there are two uses: both belong to the thing as such, but not in the same manner, for one is the proper, and the other the improper or secondary use of it. For example, a shoe is used for wear, and is used for exchange; both are uses of the shoe. He who gives a shoe in exchange for money or food to him who wants one, does indeed use the shoe as a shoe, but this is not its proper or primary purpose, for a shoe is not made to be an object of barter. The same may be said of all possessions, for the art of exchange extends to all of them, and it arises at first from what is natural, from the circumstance that some have too little, others too much. Hence we may infer that retail trade is not a natural part of the art of getting wealth; had it been so, men would have ceased to exchange when they had enough. In the first community, indeed, which is the family, this art is obviously of no use, but it begins to be useful when the society increases. For the members of the family originally had all things in common; later, when the family divided into parts, the parts shared in many things, and different parts in different things, which they had to give in exchange for what they wanted, a kind of barter which is still practiced among barbarous nations who exchange with one another the necessaries of life and nothing more;

giving and receiving wine, for example, in exchange for coin, and the like. This sort of barter is not part of the wealth-getting art and is not contrary to nature, but is needed for the satisfaction of men's natural wants. The other or more complex form of exchange grew, as might have been inferred, out of the simpler. When the inhabitants of one country became more dependent on those of another, and they imported what they needed, and exported what they had too much of, money necessarily came into use. For the various necessaries of life are not easily carried about, and hence men agreed to employ in their dealings with each other something which was intrinsically useful and easily applicable to the purposes of life, for example, iron, silver, and the like. Of this the value was at first measured simply by size and weight, but in process of time they put a stamp upon it, to save the trouble of weighing and to mark the value.

When the use of coin had once been discovered, out of the barter of necessary articles arose the other art of wealth getting, namely, retail trade; which was at first probably a simple matter, but became more complicated as soon as men learned by experience whence and by what exchanges the greatest profit might be made. Originating in the use of coin, the art of getting wealth is generally thought to be chiefly concerned with it, and to be the art which produces riches and wealth; having to consider how they may be accumulated. Indeed, riches is assumed by many to be only a quantity of coin, because the arts of getting wealth and retail trade are concerned with coin. Others maintain that coined money is a mere sham, a thing not natural, but conventional only, because, if the users substitute another commodity for it, it is worthless, and because it is not useful as a means to any of the necessities of life, and, indeed, he who is rich in coin may often be in want of necessary food. But how can that be wealth of which a man may have a great abundance and yet perish with hunger, like Midas in the fable,

whose insatiable prayer turned everything that was set before him into gold?

Hence men seek after a better notion of riches and of the art of getting wealth than the mere acquisition of coin, and they are right. For natural riches and the natural art of wealth-getting are a different thing; in their true form they are part of the management of a household; whereas retail trade is the art of producing wealth, not in every way, but by exchange. And it is thought to be concerned with coin; for coin is the unit of exchange and the measure or limit of it. And there is no bound to the riches which spring from this art of wealth getting. As in the art of medicine there is no limit to the pursuit of health, and as in the other arts there is no limit to the pursuit of their several ends, for they aim at accomplishing their ends to the uttermost (but of the means there is a limit, for the end is always the limit), so, too, in this art of wealth-getting there is no limit of the end, which is riches of the spurious kind, and the acquisition of wealth. But the art of wealth-getting which consists in household management, on the other hand, has a limit; the unlimited acquisition of wealth is not its business. And, therefore, in one point of view, all riches must have a limit; nevertheless, as a matter of fact, we find the opposite to be the case; for all getters of wealth increase their hoard of coin without limit. The source of the confusion is the near connection between the two kinds of wealth-getting; in either, the instrument is the same, although the use is different, and so they pass into one another; for each is a use of the same property, but with a difference: accumulation is the end in the one case, but there is a further end in the other. Hence some persons are led to believe that getting wealth is the object of household management, and the whole idea of their lives is that they ought either to increase their money without limit, or at any rate not to lose it. The origin of this disposition in men is that they are intent upon living only, and not upon living well;

and, as their desires are unlimited they also desire that the means of gratifying them should be without limit. Those who do aim at a good life seek the means of obtaining bodily pleasures; and, since the enjoyment of these appears to depend on property, they are absorbed in getting wealth: and so there arises the second species of wealth-getting. For, as their enjoyment is in excess, they seek an art which produces the excess of enjoyment; and, if they are not able to supply their pleasures by the art of getting wealth, they try other arts, using in turn every faculty in a manner contrary to nature. The quality of courage, for example, is not intended to make wealth, but to inspire confidence; neither is this the aim of the general's or of the physician's art; but the one aims at victory and the other at health. Nevertheless, some men turn every quality or art into a means of getting wealth; this they conceive to be the end, and to the promotion of the end they think all things must contribute.

Thus, then, we have considered the art of wealth-getting which is unnecessary, and why men want it; and also the necessary art of wealth-getting, which we have seen to be different from the other, and to be a natural part of the art of managing a household, concerned with the provision of food, not, however, like the former kind, unlimited, but having a limit.

10

And we have found the answer to our original question, Whether the art of getting wealth is the business of the manager of a household and of the statesman or not their business? viz., that wealth is presupposed by them. For as political science does not make men, but takes them from

nature and uses them, so too nature provides them with earth or sea or the like as a source of food. At this stage begins the duty of the manager of a household, who has to order the things which nature supplies; he may be compared to the weaver who has not to make but to use wool, and to know, too, what sort of wool is good and serviceable or bad and unserviceable. Were this otherwise, it would be difficult to see why the art of getting wealth is a part of the management of a household and the art of medicine not; for surely the members of a household must have health just as they must have life or any other necessary. The answer is that as from one point of view the master of the house and the ruler of the state have to consider about health, from another point of view not they but the physician; so in one way the art of household management, in another way the subordinate art, has to consider about wealth. But, strictly speaking, as I have already said, the means of life must be provided beforehand by nature; for the business of nature is to furnish food to that which is born, and the food of the offspring is always what remains over of that from which it is produced. Wherefore the art of getting wealth out of fruits and animals is always natural.

There are two sorts of wealth-getting, as I have said; one is a part of household management, the other is retail trade: the former necessary and honorable, while that which consists in exchange is justly censured; for it is unnatural, and a mode by which men gain from one another. The most hated sort, and with the greatest reason, is usury, which makes a gain out of money itself, and not from the natural object of it. For money was intended to be used in exchange, but not to increase at interest. And this term interest, which means the birth of money from money, is applied to the breeding of money because the offspring resembles the parent. Wherefore of an modes of getting wealth this is the most unnatural.

11

Enough has been said about the theory of wealth-getting; we will now proceed to the practical part. The discussion of such matters is not unworthy of philosophy, but to be engaged in them practically is illiberal and irksome. The useful parts of wealth-getting are, first, the knowledge of livestock – which are most profitable, and where, and how – as, for example, what sort of horses or sheep or oxen or any other animals are most likely to give a return. A man ought to know which of these pay better than others, and which pay best in particular places, for some do better in one place and some in another. Secondly, husbandry, which may be either tillage or planting, and the keeping of bees and of fish, or fowl, or of any animals which may be useful to man. These are the divisions of the true or proper art of wealth-getting and come first. Of the other, which consists in exchange, the first and most important division is commerce (of which there are three kinds – the provision of a ship, the conveyance of goods, exposure for sale – these again differing as they are safer or more profitable), the second is usury, the third, service for hire – of this, one kind is employed in the mechanical arts, the other in unskilled and bodily labor. There is still a third sort of wealth getting intermediate between this and the first or natural mode which is partly natural, but is also concerned with exchange, viz., the industries that make their profit from the earth, and from things growing from the earth which, although they bear no fruit, are nevertheless profitable; for example, the cutting of timber and all mining. The art of mining, by which minerals are obtained, itself has many branches, for there are various kinds of things dug out of the earth. Of the several divisions of wealth-getting I now speak

generally; a minute consideration of them might be useful in practice, but it would be tiresome to dwell upon them at greater length now.

Those occupations are most truly arts in which there is the least element of chance; they are the meanest in which the body is most deteriorated, the most servile in which there is the greatest use of the body, and the most illiberal in which there is the least need of excellence.

Works have been written upon these subjects by various persons; for example, by Chares the Parian, and Apollodorus the Lemnian, who have treated of Tillage and Planting, while others have treated of other branches; any one who cares for such matters may refer to their writings. It would be well also to collect the scattered stories of the ways in which individuals have succeeded in amassing a fortune; for all this is useful to persons who value the art of getting wealth. There is the anecdote of Thales the Milesian and his financial device, which involves a principle of universal application, but is attributed to him on account of his reputation for wisdom. He was reproached for his poverty, which was supposed to show that philosophy was of no use. According to the story, he knew by his skill in the stars while it was yet winter that there would be a great harvest of olives in the coming year; so, having a little money, he gave deposits for the use of all the olive-presses in Chios and Miletus, which he hired at a low price because no one bid against him. When the harvest-time came, and many were wanted all at once and of a sudden, he let them out at any rate which he pleased, and made a quantity of money. Thus he showed the world that philosophers can easily be rich if they like, but that their ambition is of another sort. He is supposed to have given a striking proof of his wisdom, but, as I was saying, his device for getting wealth is of universal application, and is nothing but the creation of a monopoly. It is an art often

practiced by cities when they are want of money; they make a monopoly of provisions.

There was a man of Sicily, who, having money deposited with him, bought up an the iron from the iron mines; afterwards, when the merchants from their various markets came to buy, he was the only seller, and without much increasing the price he gained 200 per cent. Which when Dionysius heard, he told him that he might take away his money, but that he must not remain at Syracuse, for he thought that the man had discovered a way of making money which was injurious to his own interests. He made the same discovery as Thales; they both contrived to create a monopoly for themselves. And statesmen as well ought to know these things; for a state is often as much in want of money and of such devices for obtaining it as a household, or even more so; hence some public men devote themselves entirely to finance.

12

Of household management we have seen that there are three parts – one is the rule of a master over slaves, which has been discussed already, another of a father, and the third of a husband. A husband and father, we saw, rules over wife and children, both free, but the rule differs, the rule over his children being a royal, over his wife a constitutional rule. For although there may be exceptions to the order of nature, the male is by nature fitter for command than the female, just as the elder and full-grown is superior to the younger and more immature. But in most constitutional states the citizens rule and are ruled by turns, for the idea of a constitutional state implies that the natures of the citizens are equal, and do not differ at all.

Nevertheless, when one rules and the other is ruled we endeavor to create a difference of outward forms and names and titles of respect, which may be illustrated by the saying of Amasis about his foot-pan. The relation of the male to the female is of this kind, but there the inequality is permanent. The rule of a father over his children is royal, for he rules by virtue both of love and of the respect due to age, exercising a kind of royal power. And therefore Homer has appropriately called Zeus 'father of Gods and men,' because he is the king of them all. For a king is the natural superior of his subjects, but he should be of the same kin or kind with them, and such is the relation of elder and younger, of father and son.

13

Thus it is clear that household management attends more to men than to the acquisition of inanimate things, and to human excellence more than to the excellence of property which we call wealth, and to the virtue of freemen more than to the virtue of slaves. A question may indeed be raised, whether there is any excellence at all in a slave beyond and higher than merely instrumental and ministerial qualities – whether he can have the virtues of temperance, courage, justice, and the like; or whether slaves possess only bodily and ministerial qualities. And, whichever way we answer the question, a difficulty arises; for, if they have virtue, in what will they differ from freemen? On the other hand, since they are men and share in rational principle, it seems absurd to say that they have no virtue. A similar question may be raised about women and children, whether they too have virtues: ought a woman to be temperate and brave and just, and is a child to be called temperate, and intemperate, or note So in general we may ask about the natural

ruler, and the natural subject, whether they have the same or different virtues. For if a noble nature is equally required in both, why should one of them always rule, and the other always be ruled? Nor can we say that this is a question of degree, for the difference between ruler and subject is a difference of kind, which the difference of more and less never is. Yet how strange is the supposition that the one ought, and that the other ought not, to have virtue! For if the ruler is intemperate and unjust, how can he rule well? If the subject, how can he obey well? If he be licentious and cowardly, he will certainly not do his duty. It is evident, therefore, that both of them must have a share of virtue, but varying as natural subjects also vary among themselves. Here the very constitution of the soul has shown us the way; in it one part naturally rules, and the other is subject, and the virtue of the ruler we in maintain to be different from that of the subject; the one being the virtue of the rational, and the other of the irrational part. Now, it is obvious that the same principle applies generally, and therefore almost all things rule and are ruled according to nature. But the kind of rule differs; the freeman rules over the slave after another manner from that in which the male rules over the female, or the man over the child; although the parts of the soul are present in an of them, they are present in different degrees. For the slave has no deliberative faculty at all; the woman has, but it is without authority, and the child has, but it is immature. So it must necessarily be supposed to be with the moral virtues also; all should partake of them, but only in such manner and degree as is required by each for the fulfillment of his duty. Hence the ruler ought to have moral virtue in perfection, for his function, taken absolutely, demands a master artificer, and rational principle is such an artificer; the subjects, oil the other hand, require only that measure of virtue which is proper to each of them. Clearly, then, moral virtue belongs to all of them; but the temperance of a man and of a woman, or the courage and

justice of a man and of a woman, are not, as Socrates maintained, the same; the courage of a man is shown in commanding, of a woman in obeying. And this holds of all other virtues, as will be more clearly seen if we look at them in detail, for those who say generally that virtue consists in a good disposition of the soul, or in doing rightly, or the like, only deceive themselves. Far better than such definitions is their mode of speaking, who, like Gorgias, enumerate the virtues. All classes must be deemed to have their special attributes; as the poet says of women,

Silence is a woman's glory,

but this is not equally the glory of man. The child is imperfect, and therefore obviously his virtue is not relative to himself alone, but to the perfect man and to his teacher, and in like manner the virtue of the slave is relative to a master. Now we determined that a slave is useful for the wants of life, and therefore he will obviously require only so much virtue as will prevent him from failing in his duty through cowardice or lack of self-control. Some one will ask whether, if what we are saying is true, virtue will not be required also in the artisans, for they often fail in their work through the lack of self control? But is there not a great difference in the two cases? For the slave shares in his master's life; the artisan is less closely connected with him, and only attains excellence in proportion as he becomes a slave. The meaner sort of mechanic has a special and separate slavery; and whereas the slave exists by nature, not so the shoemaker or other artisan. It is manifest, then, that the master ought to be the source of such excellence in the slave, and not a mere possessor of the art of mastership which trains the slave in his duties. Wherefore they are mistaken who forbid us to converse with slaves and say that we should employ command only, for slaves stand even more in need of admonition than children.

So much for this subject; the relations of husband and wife, parent and child, their several virtues, what in their intercourse with one another is good, and what is evil, and how we may pursue the good and good and escape the evil, will have to be discussed when we speak of the different forms of government. For, inasmuch as every family is a part of a state, and these relationships are the parts of a family, and the virtue of the part must have regard to the virtue of the whole, women and children must be trained by education with an eye to the constitution, if the virtues of either of them are supposed to make any difference in the virtues of the state. And they must make a difference: for the children grow up to be citizens, and half the free persons in a state are women.

Of these matters, enough has been said; of what remains, let us speak at another time. Regarding, then, our present inquiry as complete, we will make a new beginning. And, first, let us examine the various theories of a perfect state.

Book II

1

Our purpose is to consider what form of political community is best of all for those who are most able to realize their ideal of life. We must therefore examine not only this but other constitutions, both such as actually exist in well-governed states, and any theoretical forms which are held in esteem; that

what is good and useful may be brought to light. And let no one suppose that in seeking for something beyond them we are anxious to make a sophistical display at any cost; we only undertake this inquiry because all the constitutions with which we are acquainted are faulty.

We will begin with the natural beginning of the subject. Three alternatives are conceivable: The members of a state must either have (1) all things or (2) nothing in common, or (3) some things in common and some not. That they should have nothing in common is clearly impossible, for the constitution is a community, and must at any rate have a common place – one city will be in one place, and the citizens are those who share in that one city. But should a well ordered state have all things, as far as may be, in common, or some only and not others? For the citizens might conceivably have wives and children and property in common, as Socrates proposes in the Republic of Plato. Which is better, our present condition, or the proposed new order of society.

2

There are many difficulties in the community of women. And the principle on which Socrates rests the necessity of such an institution evidently is not established by his arguments. Further, as a means to the end which he ascribes to the state, the scheme, taken literally is impracticable, and how we are to interpret it is nowhere precisely stated. I am speaking of the premise from which the argument of Socrates proceeds, 'that the greater the unity of the state the better.' Is it not obvious that a state may at length attain such a degree of unity as to be no longer a state? since the nature of a state is to be a plurality,

and in tending to greater unity, from being a state, it becomes a family, and from being a family, an individual; for the family may be said to be more than the state, and the individual than the family. So that we ought not to attain this greatest unity even if we could, for it would be the destruction of the state. Again, a state is not made up only of so many men, but of different kinds of men; for similars do not constitute a state. It is not like a military alliance The usefulness of the latter depends upon its quantity even where there is no difference in quality (for mutual protection is the end aimed at), just as a greater weight of anything is more useful than a less (in like manner, a state differs from a nation, when the nation has not its population organized in villages, but lives an Arcadian sort of life); but the elements out of which a unity is to be formed differ in kind. Wherefore the principle of compensation, as I have already remarked in the Ethics, is the salvation of states. Even among freemen and equals this is a principle which must be maintained, for they cannot an rule together, but must change at the end of a year or some other period of time or in some order of succession. The result is that upon this plan they all govern; just as if shoemakers and carpenters were to exchange their occupations, and the same persons did not always continue shoemakers and carpenters. And since it is better that this should be so in politics as well, it is clear that while there should be continuance of the same persons in power where this is possible, yet where this is not possible by reason of the natural equality of the citizens, and at the same time it is just that an should share in the government (whether to govern be a good thing or a bad), an approximation to this is that equals should in turn retire from office and should, apart from official position, be treated alike. Thus the one party rule and the others are ruled in turn, as if they were no longer the same persons. In like manner when they hold office there is a variety in the offices held. Hence it is evident that a city is not by nature one

in that sense which some persons affirm; and that what is said to be the greatest good of cities is in reality their destruction; but surely the good of things must be that which preserves them. Again, in another point of view, this extreme unification of the state is clearly not good; for a family is more self-sufficing than an individual, and a city than a family, and a city only comes into being when the community is large enough to be self-sufficing. If then self-sufficiency is to be desired, the lesser degree of unity is more desirable than the greater.

3

But, even supposing that it were best for the community to have the greatest degree of unity, this unity is by no means proved to follow from the fact 'of all men saying "mine" and "not mine" at the same instant of time,' which, according to Socrates, is the sign of perfect unity in a state. For the word 'all' is ambiguous. If the meaning be that every individual says 'mine' and 'not mine' at the same time, then perhaps the result at which Socrates aims may be in some degree accomplished; each man will call the same person his own son and the same person his wife, and so of his property and of all that falls to his lot. This, however, is not the way in which people would speak who had their had their wives and children in common; they would say 'all' but not 'each.' In like manner their property would be described as belonging to them, not severally but collectively. There is an obvious fallacy in the term 'all': like some other words, 'both,' 'odd,' 'even,' it is ambiguous, and even in abstract argument becomes a source of logical puzzles. That all persons call the same thing mine in the sense in which each does so may be a fine thing, but it is impracticable; or if the words are taken in the other sense, such a unity in no way conduces to harmony.

And there is another objection to the proposal. For that which is common to the greatest number has the least care bestowed upon it. Every one thinks chiefly of his own, hardly at all of the common interest; and only when he is himself concerned as an individual. For besides other considerations, everybody is more inclined to neglect the duty which he expects another to fulfill; as in families many attendants are often less useful than a few. Each citizen will have a thousand sons who will not be his sons individually but anybody will be equally the son of anybody, and will therefore be neglected by all alike. Further, upon this principle, every one will use the word 'mine' of one who is prospering or the reverse, however small a fraction he may himself be of the whole number; the same boy will be 'so and so's son,' the son of each of the thousand, or whatever be the number of the citizens; and even about this he will not be positive; for it is impossible to know who chanced to have a child, or whether, if one came into existence, it has survived. But which is better – for each to say 'mine' in this way, making a man the same relation to two thousand or ten thousand citizens, or to use the word 'mine' in the ordinary and more restricted sense? For usually the same person is called by one man his own son whom another calls his own brother or cousin or kinsman – blood relation or connection by marriage either of himself or of some relation of his, and yet another his clansman or tribesman; and how much better is it to be the real cousin of somebody than to be a son after Plato's fashion! Nor is there any way of preventing brothers and children and fathers and mothers from sometimes recognizing one another; for children are born like their parents, and they will necessarily be finding indications of their relationship to one another. Geographers declare such to be the fact; they say that in part of Upper Libya, where the women are common, nevertheless the children who are born are assigned to their respective fathers on the ground of their likeness. And some women, like the females of other

animals – for example, mares and cows – have a strong tendency to produce offspring resembling their parents, as was the case with the Pharsalian mare called Honest.

4

Other evils, against which it is not easy for the authors of such a community to guard, will be assaults and homicides, voluntary as well as involuntary, quarrels and slanders, all which are most unholy acts when committed against fathers and mothers and near relations, but not equally unholy when there is no relationship. Moreover, they are much more likely to occur if the relationship is unknown, and, when they have occurred, the customary expiations of them cannot be made. Again, how strange it is that Socrates, after having made the children common, should hinder lovers from carnal intercourse only, but should permit love and familiarities between father and son or between brother and brother, than which nothing can be more unseemly, since even without them love of this sort is improper. How strange, too, to forbid intercourse for no other reason than the violence of the pleasure, as though the relationship of father and son or of brothers with one another made no difference.

This community of wives and children seems better suited to the husbandmen than to the guardians, for if they have wives and children in common, they will be bound to one another by weaker ties, as a subject class should be, and they will remain obedient and not rebel. In a word, the result of such a law would be just the opposite of which good laws ought to have, and the intention of Socrates in making these regulations about women and children would defeat itself. For friendship we believe to be the greatest good of states and the preservative of them against

revolutions; neither is there anything which Socrates so greatly lauds as the unity of the state which he and all the world declare to be created by friendship. But the unity which he commends would be like that of the lovers in the Symposium, who, as Aristophanes says, desire to grow together in the excess of their affection, and from being two to become one, in which case one or both would certainly perish. Whereas in a state having women and children common, love will be watery; and the father will certainly not say 'my son,' or the son 'my father.' As a little sweet wine mingled with a great deal of water is imperceptible in the mixture, so, in this sort of community, the idea of relationship which is based upon these names will be lost; there is no reason why the so-called father should care about the son, or the son about the father, or brothers about one another. Of the two qualities which chiefly inspire regard and affection – that a thing is your own and that it is your only one – neither can exist in such a state as this.

Again, the transfer of children as soon as they are born from the rank of husbandmen or of artisans to that of guardians, and from the rank of guardians into a lower rank, will be very difficult to arrange; the givers or transferrers cannot but know whom they are giving and transferring, and to whom. And the previously mentioned evils, such as assaults, unlawful loves, homicides, will happen more often amongst those who are transferred to the lower classes, or who have a place assigned to them among the guardians; for they will no longer call the members of the class they have left brothers, and children, and fathers, and mothers, and will not, therefore, be afraid of committing any crimes by reason of consanguinity. Touching the community of wives and children, let this be our conclusion.

5

Next let us consider what should be our arrangements about property: should the citizens of the perfect state have their possessions in common or not? This question may be discussed separately from the enactments about women and children. Even supposing that the women and children belong to individuals, according to the custom which is at present universal, may there not be an advantage in having and using possessions in common? Three cases are possible: (1) the soil may be appropriated, but the produce may be thrown for consumption into the common stock; and this is the practice of some nations. Or (2), the soil may be common, and may be cultivated in common, but the produce divided among individuals for their private use; this is a form of common property which is said to exist among certain barbarians. Or (3), the soil and the produce may be alike common.

When the husbandmen are not the owners, the case will be different and easier to deal with; but when they till the ground for themselves the question of ownership will give a world of trouble. If they do not share equally enjoyments and toils, those who labor much and get little will necessarily complain of those who labor little and receive or consume much. But indeed there is always a difficulty in men living together and having all human relations in common, but especially in their having common property. The partnerships of fellow-travelers are an example to the point; for they generally fall out over everyday matters and quarrel about any trifle which turns up. So with servants: we are most able to take offense at those with whom we most we most frequently come into contact in daily life.

These are only some of the disadvantages which attend the community of property; the present arrangement, if improved as it might be by good customs and laws, would be far better,

and would have the advantages of both systems. Property should be in a certain sense common, but, as a general rule, private; for, when everyone has a distinct interest, men will not complain of one another, and they will make more progress, because every one will be attending to his own business. And yet by reason of goodness, and in respect of use, 'Friends,' as the proverb says, 'will have all things common.' Even now there are traces of such a principle, showing that it is not impracticable, but, in well-ordered states, exists already to a certain extent and may be carried further. For, although every man has his own property, some things he will place at the disposal of his friends, while of others he shares the use with them. The Lacedaemonians, for example, use one another's slaves, and horses, and dogs, as if they were their own; and when they lack provisions on a journey, they appropriate what they find in the fields throughout the country. It is clearly better that property should be private, but the use of it common; and the special business of the legislator is to create in men this benevolent disposition. Again, how immeasurably greater is the pleasure, when a man feels a thing to be his own; for surely the love of self is a feeling implanted by nature and not given in vain, although selfishness is rightly censured; this, however, is not the mere love of self, but the love of self in excess, like the miser's love of money; for all, or almost all, men love money and other such objects in a measure. And further, there is the greatest pleasure in doing a kindness or service to friends or guests or companions, which can only be rendered when a man has private property. These advantages are lost by excessive unification of the state. The exhibition of two virtues, besides, is visibly annihilated in such a state: first, temperance towards women (for it is an honorable action to abstain from another's wife for temperance' sake); secondly, liberality in the matter of property. No one, when men have all things in common, will

any longer set an example of liberality or do any liberal action; for liberality consists in the use which is made of property.

Such legislation may have a specious appearance of benevolence; men readily listen to it, and are easily induced to believe that in some wonderful manner everybody will become everybody's friend, especially when some one is heard denouncing the evils now existing in states, suits about contracts, convictions for perjury, flatteries of rich men and the like, which are said to arise out of the possession of private property. These evils, however, are due to a very different cause – the wickedness of human nature. Indeed, we see that there is much more quarrelling among those who have all things in common, though there are not many of them when compared with the vast numbers who have private property.

Again, we ought to reckon, not only the evils from which the citizens will be saved, but also the advantages which they will lose. The life which they are to lead appears to be quite impracticable. The error of Socrates must be attributed to the false notion of unity from which he starts. Unity there should be, both of the family and of the state, but in some respects only. For there is a point at which a state may attain such a degree of unity as to be no longer a state, or at which, without actually ceasing to exist, it will become an inferior state, like harmony passing into unison, or rhythm which has been reduced to a single foot. The state, as I was saying, is a plurality which should be united and made into a community by education; and it is strange that the author of a system of education which he thinks will make the state virtuous, should expect to improve his citizens by regulations of this sort, and not by philosophy or by customs and laws, like those which prevail at Sparta and Crete respecting common meals, whereby the legislator has made property common. Let us remember that we should not disregard the experience of ages; in the

multitude of years these things, if they were good, would certainly not have been unknown; for almost everything has been found out, although sometimes they are not put together; in other cases men do not use the knowledge which they have. Great light would be thrown on this subject if we could see such a form of government in the actual process of construction; for the legislator could not form a state at all without distributing and dividing its constituents into associations for common meals, and into phratries and tribes. But all this legislation ends only in forbidding agriculture to the guardians, a prohibition which the Lacedaemonians try to enforce already.

But, indeed, Socrates has not said, nor is it easy to decide, what in such a community will be the general form of the state. The citizens who are not guardians are the majority, and about them nothing has been determined: are the husbandmen, too, to have their property in common? Or is each individual to have his own? And are the wives and children to be individual or common. If, like the guardians, they are to have all things in common, what do they differ from them, or what will they gain by submitting to their government? Or, upon what principle would they submit, unless indeed the governing class adopt the ingenious policy of the Cretans, who give their slaves the same institutions as their own, but forbid them gymnastic exercises and the possession of arms. If, on the other hand, the inferior classes are to be like other cities in respect of marriage and property, what will be the form of the community? Must it not contain two states in one, each hostile to the other He makes the guardians into a mere occupying garrison, while the husbandmen and artisans and the rest are the real citizens. But if so the suits and quarrels, and all the evils which Socrates affirms to exist in other states, will exist equally among them. He says indeed that, having so good an education, the citizens will not need many laws, for example laws about the city or about the markets; but then he confines his education to the

guardians. Again, he makes the husbandmen owners of the property upon condition of their paying a tribute. But in that case they are likely to be much more unmanageable and conceited than the Helots, or Penestae, or slaves in general. And whether community of wives and property be necessary for the lower equally with the higher class or not, and the questions akin to this, what will be the education, form of government, laws of the lower class, Socrates has nowhere determined: neither is it easy to discover this, nor is their character of small importance if the common life of the guardians is to be maintained.

Again, if Socrates makes the women common, and retains private property, the men will see to the fields, but who will see to the house? And who will do so if the agricultural class have both their property and their wives in common? Once more: it is absurd to argue, from the analogy of the animals, that men and women should follow the same pursuits, for animals have not to manage a household. The government, too, as constituted by Socrates, contains elements of danger; for he makes the same persons always rule. And if this is often a cause of disturbance among the meaner sort, how much more among high-spirited warriors? But that the persons whom he makes rulers must be the same is evident; for the gold which the God mingles in the souls of men is not at one time given to one, at another time to another, but always to the same: as he says, 'God mingles gold in some, and silver in others, from their very birth; but brass and iron in those who are meant to be artisans and husbandmen.' Again, he deprives the guardians even of happiness, and says that the legislator ought to make the whole state happy. But the whole cannot be happy unless most, or all, or some of its parts enjoy happiness. In this respect happiness is not like the even principle in numbers, which may exist only in the whole, but in neither of the parts; not so happiness. And if the guardians are not happy, who are? Surely not the artisans,

or the common people. The Republic of which Socrates discourses has all these difficulties, and others quite as great.

6

The same, or nearly the same, objections apply to Plato's later work, the Laws, and therefore we had better examine briefly the constitution which is therein described. In the Republic, Socrates has definitely settled in all a few questions only; such as the community of women and children, the community of property, and the constitution of the state. The population is divided into two classes – one of husbandmen, and the other of warriors; from this latter is taken a third class of counselors and rulers of the state. But Socrates has not determined whether the husbandmen and artisans are to have a share in the government, and whether they, too, are to carry arms and share in military service, or not. He certainly thinks that the women ought to share in the education of the guardians, and to fight by their side. The remainder of the work is filled up with digressions foreign to the main subject, and with discussions about the education of the guardians. In the Laws there is hardly anything but laws; not much is said about the constitution. This, which he had intended to make more of the ordinary type, he gradually brings round to the other or ideal form. For with the exception of the community of women and property, he supposes everything to be the same in both states; there is to be the same education; the citizens of both are to live free from servile occupations, and there are to be common meals in both. The only difference is that in the Laws, the common meals are extended to women, and the warriors number 5000, but in the Republic only 1000.

The discourses of Socrates are never commonplace; they always exhibit grace and originality and thought; but perfection in everything can hardly be expected. We must not overlook the fact that the number of 5000 citizens, just now mentioned, will require a territory as large as Babylon, or some other huge site, if so many persons are to be supported in idleness, together with their women and attendants, who will be a multitude many times as great. In framing an ideal we may assume what we wish, but should avoid impossibilities.

It is said that the legislator ought to have his eye directed to two points – the people and the country. But neighboring countries also must not be forgotten by him, firstly because the state for which he legislates is to have a political and not an isolated life. For a state must have such a military force as will be serviceable against her neighbors, and not merely useful at home. Even if the life of action is not admitted to be the best, either for individuals or states, still a city should be formidable to enemies, whether invading or retreating.

There is another point: Should not the amount of property be defined in some way which differs from this by being clearer? For Socrates says that a man should have so much property as will enable him to live temperately, which is only a way of saying 'to live well'; this is too general a conception. Further, a man may live temperately and yet miserably. A better definition would be that a man must have so much property as will enable him to live not only temperately but liberally; if the two are parted, liberally will combine with luxury; temperance will be associated with toil. For liberality and temperance are the only eligible qualities which have to do with the use of property. A man cannot use property with mildness or courage, but temperately and liberally he may; and therefore the practice of these virtues is inseparable from property. There is an inconsistency, too, in too, in equalizing the property and not

regulating the number of the citizens; the population is to remain unlimited, and he thinks that it will be sufficiently equalized by a certain number of marriages being unfruitful, however many are born to others, because he finds this to be the case in existing states. But greater care will be required than now; for among ourselves, whatever may be the number of citizens, the property is always distributed among them, and therefore no one is in want; but, if the property were incapable of division as in the Laws, the supernumeraries, whether few or many, would get nothing. One would have thought that it was even more necessary to limit population than property; and that the limit should be fixed by calculating the chances of mortality in the children, and of sterility in married persons. The neglect of this subject, which in existing states is so common, is a never-failing cause of poverty among the citizens; and poverty is the parent of revolution and crime. Pheidon the Corinthian, who was one of the most ardent legislators, thought that the families and the number of citizens ought to remain the same, although originally all the lots may have been of different sizes: but in the Laws the opposite principle is maintained. What in our opinion is the right arrangement will have to be explained hereafter.

There is another omission in the Laws: Socrates does not tell us how the rulers differ from their subjects; he only says that they should be related as the warp and the woof, which are made out of different wools. He allows that a man's whole property may be increased fivefold, but why should not his land also increase to a certain extent? Again, will the good management of a household be promoted by his arrangement of homesteads? For he assigns to each individual two homesteads in separate places, and it is difficult to live in two houses.

The whole system of government tends to be neither democracy nor oligarchy, but something in a mean between

them, which is usually called a polity, and is composed of the heavy-armed soldiers. Now, if he intended to frame a constitution which would suit the greatest number of states, he was very likely right, but not if he meant to say that this constitutional form came nearest to his first or ideal state; for many would prefer the Lacedaemonian, or, possibly, some other more aristocratic government. Some, indeed, say that the best constitution is a combination of all existing forms, and they praise the Lacedaemonian because it is made up of oligarchy, monarchy, and democracy, the king forming the monarchy, and the council of elders the oligarchy while the democratic element is represented by the Ephors; for the Ephors are selected from the people. Others, however, declare the Ephoralty to be a tyranny, and find the element of democracy in the common meals and in the habits of daily life. In the Laws it is maintained that the best constitution is made up of democracy and tyranny, which are either not constitutions at all, or are the worst of all. But they are nearer the truth who combine many forms; for the constitution is better which is made up of more numerous elements. The constitution proposed in the Laws has no element of monarchy at all; it is nothing but oligarchy and democracy, leaning rather to oligarchy. This is seen in the mode of appointing magistrates; for although the appointment of them by lot from among those who have been already selected combines both elements, the way in which the rich are compelled by law to attend the assembly and vote for magistrates or discharge other political duties, while the rest may do as they like, and the endeavor to have the greater number of the magistrates appointed out of the richer classes and the highest officers selected from those who have the greatest incomes, both these are oligarchical features. The oligarchical principle prevails also in the choice of the council, for all are compelled to choose, but the compulsion extends only to the choice out of the first class, and of an equal number

out of the second class and out of the third class, but not in this latter case to all the voters but to those of the first three classes; and the selection of candidates out of the fourth class is only compulsory on the first and second. Then, from the persons so chosen, he says that there ought to be an equal number of each class selected. Thus a preponderance will be given to the better sort of people, who have the larger incomes, because many of the lower classes, not being compelled will not vote. These considerations, and others which will be adduced when the time comes for examining similar polities, tend to show that states like Plato's should not be composed of democracy and monarchy. There is also a danger in electing the magistrates out of a body who are themselves elected; for, if but a small number choose to combine, the elections will always go as they desire. Such is the constitution which is described in the Laws.

7

Other constitutions have been proposed; some by private persons, others by philosophers and statesmen, which all come nearer to established or existing ones than either of Plato's. No one else has introduced such novelties as the community of women and children, or public tables for women: other legislators begin with what is necessary. In the opinion of some, the regulation of property is the chief point of all, that being the question upon which all revolutions turn. This danger was recognized by Phaleas of Chalcedon, who was the first to affirm that the citizens of a state ought to have equal possessions. He thought that in a new colony the equalization might be accomplished without difficulty, not so easily when a state was already established; and that then the shortest way of compassing the desired end would be for the rich to give and

not to receive marriage portions, and for the poor not to give but to receive them.

Plato in the Laws was of opinion that, to a certain extent, accumulation should be allowed, forbidding, as I have already observed, any citizen to possess more than five times the minimum qualification But those who make such laws should remember what they are apt to forget – that the legislator who fixes the amount of property should also fix the number of children; for, if the children are too many for the property, the law must be broken. And, besides the violation of the law, it is a bad thing that many from being rich should become poor; for men of ruined fortunes are sure to stir up revolutions. That the equalization of property exercises an influence on political society was clearly understood even by some of the old legislators. Laws were made by Solon and others prohibiting an individual from possessing as much land as he pleased; and there are other laws in states which forbid the sale of property: among the Locrians, for example, there is a law that a man is not to sell his property unless he can prove unmistakably that some misfortune has befallen him. Again, there have been laws which enjoin the preservation of the original lots. Such a law existed in the island of Leucas, and the abrogation of it made the constitution too democratic, for the rulers no longer had the prescribed qualification. Again, where there is equality of property, the amount may be either too large or too small, and the possessor may be living either in luxury or penury. Clearly, then, the legislator ought not only to aim at the equalization of properties, but at moderation in their amount. Further, if he prescribe this moderate amount equally to all, he will be no nearer the mark; for it is not the possessions but the desires of mankind which require to be equalized, and this is impossible, unless a sufficient education is provided by the laws. But Phaleas will probably reply that this is precisely what he means; and that, in his opinion, there ought to be in states, not only

equal property, but equal education. Still he should tell precisely what he means; and that, in his opinion, there ought to be in be in having one and the same for all, if it is of a sort that predisposes men to avarice, or ambition, or both. Moreover, civil troubles arise, not only out of the inequality of property, but out of the inequality of honor, though in opposite ways. For the common people quarrel about the inequality of property, the higher class about the equality of honor; as the poet says,

The bad and good alike in honor share.

There are crimes of which the motive is want; and for these Phaleas expects to find a cure in the equalization of property, which will take away from a man the temptation to be a highwayman, because he is hungry or cold. But want is not the sole incentive to crime; men also wish to enjoy themselves and not to be in a state of desire – they wish to cure some desire, going beyond the necessities of life, which preys upon them; nay, this is not the only reason – they may desire superfluities in order to enjoy pleasures unaccompanied with pain, and therefore they commit crimes.

Now what is the cure of these three disorders? Of the first, moderate possessions and occupation; of the second, habits of temperance; as to the third, if any desire pleasures which depend on themselves, they will find the satisfaction of their desires nowhere but in philosophy; for all other pleasures we are dependent on others. The fact is that the greatest crimes are caused by excess and not by necessity. Men do not become tyrants in order that they may not suffer cold; and hence great is the honor bestowed, not on him who kills a thief, but on him who kills a tyrant. Thus we see that the institutions of Phaleas avail only against petty crimes.

There is another objection to them. They are chiefly designed to promote the internal welfare of the state. But the legislator

should consider also its relation to neighboring nations, and to all who are outside of it. The government must be organized with a view to military strength; and of this he has said not a word. And so with respect to property: there should not only be enough to supply the internal wants of the state, but also to meet dangers coming from without. The property of the state should not be so large that more powerful neighbors may be tempted by it, while the owners are unable to repel the invaders; nor yet so small that the state is unable to maintain a war even against states of equal power, and of the same character. Phaleas has not laid down any rule; but we should bear in mind that abundance of wealth is an advantage. The best limit will probably be, that a more powerful neighbor must have no inducement to go to war with you by reason of the excess of your wealth, but only such as he would have had if you had possessed less. There is a story that Eubulus, when Autophradates was going to besiege Atarneus, told him to consider how long the operation would take, and then reckon up the cost which would be incurred in the time. 'For,' said he, 'I am willing for a smaller sum than that to leave Atarneus at once.' These words of Eubulus made an impression on Autophradates, and he desisted from the siege.

The equalization of property is one of the things that tend to prevent the citizens from quarrelling. Not that the gain in this direction is very great. For the nobles will be dissatisfied because they think themselves worthy of more than an equal share of honors; and this is often found to be a cause of sedition and revolution. And the avarice of mankind is insatiable; at one time two obols was pay enough; but now, when this sum has become customary, men always want more and more without end; for it is of the nature of desire not to be satisfied, and most men live only for the gratification of it. The beginning of reform is not so much to equalize property as to train the nobler sort of natures not to desire more, and to prevent the lower from

getting more; that is to say, they must be kept down, but not ill-treated. Besides, the equalization proposed by Phaleas is imperfect; for he only equalizes land, whereas a man may be rich also in slaves, and cattle, and money, and in the abundance of what are called his movables. Now either all these things must be equalized, or some limit must be imposed on them, or they must an be let alone. It would appear that Phaleas is legislating for a small city only, if, as he supposes, all the artisans are to be public slaves and not to form a supplementary part of the body of citizens. But if there is a law that artisans are to be public slaves, it should only apply to those engaged on public works, as at Epidamnus, or at Athens on the plan which Diophantus once introduced.

From these observations any one may judge how far Phaleas was wrong or right in his ideas.

8

Hippodamus, the son of Euryphon, a native of Miletus, the same who invented the art of planning cities, and who also laid out the Piraeus – a strange man, whose fondness for distinction led him into a general eccentricity of life, which made some think him affected (for he would wear flowing hair and expensive ornaments; but these were worn on a cheap but warm garment both in winter and summer); he, besides aspiring to be an adept in the knowledge of nature, was the first person not a statesman who made inquiries about the best form of government.

The city of Hippodamus was composed of 10,000 citizens divided into three parts – one of artisans, one of husbandmen, and a third of armed defenders of the state. He also divided the

land into three parts, one sacred, one public, the third private: the first was set apart to maintain the customary worship of the Gods, the second was to support the warriors, the third was the property of the husbandmen. He also divided laws into three classes, and no more, for he maintained that there are three subjects of lawsuits – insult, injury, and homicide. He likewise instituted a single final court of appeal, to which all causes seeming to have been improperly decided might be referred; this court he formed of elders chosen for the purpose. He was further of opinion that the decisions of the courts ought not to be given by the use of a voting pebble, but that every one should have a tablet on which he might not only write a simple condemnation, or leave the tablet blank for a simple acquittal; but, if he partly acquitted and partly condemned, he was to distinguish accordingly. To the existing law he objected that it obliged the judges to be guilty of perjury, whichever way they voted. He also enacted that those who discovered anything for the good of the state should be honored; and he provided that the children of citizens who died in battle should be maintained at the public expense, as if such an enactment had never been heard of before, yet it actually exists at Athens and in other places. As to the magistrates, he would have them all elected by the people, that is, by the three classes already mentioned, and those who were elected were to watch over the interests of the public, of strangers, and of orphans. These are the most striking points in the constitution of Hippodamus. There is not much else.

The first of these proposals to which objection may be taken is the threefold division of the citizens. The artisans, and the husbandmen, and the warriors, all have a share in the government. But the husbandmen have no arms, and the artisans neither arms nor land, and therefore they become all but slaves of the warrior class. That they should share in all the offices is an impossibility; for generals and guardians of the

citizens, and nearly all the principal magistrates, must be taken from the class of those who carry arms. Yet, if the two other classes have no share in the government, how can they be loyal citizens? It may be said that those who have arms must necessarily be masters of both the other classes, but this is not so easily accomplished unless they are numerous; and if they are, why should the other classes share in the government at all, or have power to appoint magistrates? Further, what use are farmers to the city? Artisans there must be, for these are wanted in every city, and they can live by their craft, as elsewhere; and the husbandmen too, if they really provided the warriors with food, might fairly have a share in the government. But in the republic of Hippodamus they are supposed to have land of their own, which they cultivate for their private benefit. Again, as to this common land out of which the soldiers are maintained, if they are themselves to be the cultivators of it, the warrior class will be identical with the husbandmen, although the legislator intended to make a distinction between them. If, again, there are to be other cultivators distinct both from the husbandmen, who have land of their own, and from the warriors, they will make a fourth class, which has no place in the state and no share in anything. Or, if the same persons are to cultivate their own lands, and those of the public as well, they will have difficulty in supplying the quantity of produce which will maintain two households: and why, in this case, should there be any division, for they might find food themselves and give to the warriors from the same land and the same lots? There is surely a great confusion in all this.

Neither is the law to commended which says that the judges, when a simple issue is laid before them, should distinguish in their judgement; for the judge is thus converted into an arbitrator. Now, in an arbitration, although the arbitrators are many, they confer with one another about the decision, and therefore they can distinguish; but in courts of law this is

impossible, and, indeed, most legislators take pains to prevent the judges from holding any communication with one another. Again, will there not be confusion if the judge thinks that damages should be given, but not so much as the suitor demands? He asks, say, for twenty minae, and the judge allows him ten minae (or in general the suitor asks for more and the judge allows less), while another judge allows five, another four minae. In this way they will go on splitting up the damages, and some will grant the whole and others nothing: how is the final reckoning to be taken? Again, no one contends that he who votes for a simple acquittal or condemnation perjures himself, if the indictment has been laid in an unqualified form; and this is just, for the judge who acquits does not decide that the defendant owes nothing, but that he does not owe the twenty minae. He only is guilty of perjury who thinks that the defendant ought not to pay twenty minae, and yet condemns him.

To honor those who discover anything which is useful to the state is a proposal which has a specious sound, but cannot safely be enacted by law, for it may encourage informers, and perhaps even lead to political commotions. This question involves another. It has been doubted whether it is or is not expedient to make any changes in the laws of a country, even if another law be better. Now, if an changes are inexpedient, we can hardly assent to the proposal of Hippodamus; for, under pretense of doing a public service, a man may introduce measures which are really destructive to the laws or to the constitution. But, since we have touched upon this subject, perhaps we had better go a little into detail, for, as I was saying, there is a difference of opinion, and it may sometimes seem desirable to make changes. Such changes in the other arts and sciences have certainly been beneficial; medicine, for example, and gymnastic, and every other art and craft have departed from traditional usage. And, if politics be an art, change must be

necessary in this as in any other art. That improvement has occurred is shown by the fact that old customs are exceedingly simple and barbarous. For the ancient Hellenes went about armed and bought their brides of each other. The remains of ancient laws which have come down to us are quite absurd; for example, at Cumae there is a law about murder, to the effect that if the accuser produce a certain number of witnesses from among his own kinsmen, the accused shall be held guilty. Again, men in general desire the good, and not merely what their fathers had. But the primeval inhabitants, whether they were born of the earth or were the survivors of some destruction, may be supposed to have been no better than ordinary or even foolish people among ourselves (such is certainly the tradition concerning the earth-born men); and it would be ridiculous to rest contented with their notions. Even when laws have been written down, they ought not always to remain unaltered. As in other sciences, so in politics, it is impossible that all things should be precisely set down in writing; for enactments must be universal, but actions are concerned with particulars. Hence we infer that sometimes and in certain cases laws may be changed; but when we look at the matter from another point of view, great caution would seem to be required. For the habit of lightly changing the laws is an evil, and, when the advantage is small, some errors both of lawgivers and rulers had better be left; the citizen will not gain so much by making the change as he will lose by the habit of disobedience. The analogy of the arts is false; a change in a law is a very different thing from a change in an art. For the law has no power to command obedience except that of habit, which can only be given by time, so that a readiness to change from old to new laws enfeebles the power of the law. Even if we admit that the laws are to be changed, are they all to be changed, and in every state? And are they to be changed by anybody who likes, or only by certain persons? These are very important questions; and therefore we had

better reserve the discussion of them to a more suitable occasion.

9

In the governments of Lacedaemon and Crete, and indeed in all governments, two points have to be considered: first, whether any particular law is good or bad, when compared with the perfect state; secondly, whether it is or is not consistent with the idea and character which the lawgiver has set before his citizens. That in a well-ordered state the citizens should have leisure and not have to provide for their daily wants is generally acknowledged, but there is a difficulty in seeing how this leisure is to be attained. The Thessalian Penestae have often risen against their masters, and the Helots in like manner against the Lacedaemonians, for whose misfortunes they are always lying in wait. Nothing, however, of this kind has as yet happened to the Cretans; the reason probably is that the neighboring cities, even when at war with one another, never form an alliance with rebellious serfs, rebellions not being for their interest, since they themselves have a dependent population. Whereas all the neighbors of the Lacedaemonians, whether Argives, Messenians, or Arcadians, were their enemies. In Thessaly, again, the original revolt of the slaves occurred because the Thessalians were still at war with the neighboring Achaeans, Perrhaebians, and Magnesians. Besides, if there were no other difficulty, the treatment or management of slaves is a troublesome affair; for, if not kept in hand, they are insolent, and think that they are as good as their masters, and, if harshly treated, they hate and conspire against them. Now it is clear that when these are the results the citizens of a state have not found out the secret of managing their subject population.

Again, the license of the Lacedaemonian women defeats the intention of the Spartan constitution, and is adverse to the happiness of the state. For, a husband and wife being each a part of every family, the state may be considered as about equally divided into men and women; and, therefore, in those states in which the condition of the women is bad, half the city may be regarded as having no laws. And this is what has actually happened at Sparta; the legislator wanted to make the whole state hardy and temperate, and he has carried out his intention in the case of the men, but he has neglected the women, who live in every sort of intemperance and luxury. The consequence is that in such a state wealth is too highly valued, especially if the citizen fall under the dominion of their wives, after the manner of most warlike races, except the Celts and a few others who openly approve of male loves. The old mythologer would seem to have been right in uniting Ares and Aphrodite, for all warlike races are prone to the love either of men or of women. This was exemplified among the Spartans in the days of their greatness; many things were managed by their women. But what difference does it make whether women rule, or the rulers are ruled by women? The result is the same. Even in regard to courage, which is of no use in daily life, and is needed only in war, the influence of the Lacedaemonian women has been most mischievous. The evil showed itself in the Theban invasion, when, unlike the women other cities, they were utterly useless and caused more confusion than the enemy. This license of the Lacedaemonian women existed from the earliest times, and was only what might be expected. For, during the wars of the Lacedaemonians, first against the Argives, and afterwards against the Arcadians and Messenians, the men were long away from home, and, on the return of peace, they gave themselves into the legislator's hand, already prepared by the discipline of a soldier's life (in which there are many elements of virtue), to receive his enactments. But, when

Lycurgus, as tradition says, wanted to bring the women under his laws, they resisted, and he gave up the attempt. These then are the causes of what then happened, and this defect in the constitution is clearly to be attributed to them. We are not, however, considering what is or is not to be excused, but what is right or wrong, and the disorder of the women, as I have already said, not only gives an air of indecorum to the constitution considered in itself, but tends in a measure to foster avarice.

The mention of avarice naturally suggests a criticism on the inequality of property. While some of the Spartan citizen have quite small properties, others have very large ones; hence the land has passed into the hands of a few. And this is due also to faulty laws; for, although the legislator rightly holds up to shame the sale or purchase of an inheritance, he allows anybody who likes to give or bequeath it. Yet both practices lead to the same result. And nearly two-fifths of the whole country are held by women; this is owing to the number of heiresses and to the large dowries which are customary. It would surely have been better to have given no dowries at all, or, if any, but small or moderate ones. As the law now stands, a man may bestow his heiress on any one whom he pleases, and, if he die intestate, the privilege of giving her away descends to his heir. Hence, although the country is able to maintain 1500 cavalry and 30,000 hoplites, the whole number of Spartan citizens fell below 1000. The result proves the faulty nature of their laws respecting property; for the city sank under a single defeat; the want of men was their ruin. There is a tradition that, in the days of their ancient kings, they were in the habit of giving the rights of citizenship to strangers, and therefore, in spite of their long wars, no lack of population was experienced by them; indeed, at one time Sparta is said to have numbered not less than 10,000 citizens Whether this statement is true or not, it would certainly have been better to have maintained their numbers by the equalization of property. Again, the law which relates to the

procreation of children is adverse to the correction of this inequality. For the legislator, wanting to have as many Spartans as he could, encouraged the citizens to have large families; and there is a law at Sparta that the father of three sons shall be exempt from military service, and he who has four from all the burdens of the state. Yet it is obvious that, if there were many children, the land being distributed as it is, many of them must necessarily fall into poverty.

The Lacedaemonian constitution is defective in another point; I mean the Ephoralty. This magistracy has authority in the highest matters, but the Ephors are chosen from the whole people, and so the office is apt to fall into the hands of very poor men, who, being badly off, are open to bribes. There have been many examples at Sparta of this evil in former times; and quite recently, in the matter of the Andrians, certain of the Ephors who were bribed did their best to ruin the state. And so great and tyrannical is their power, that even the kings have been compelled to court them, so that, in this way as well together with the royal office, the whole constitution has deteriorated, and from being an aristocracy has turned into a democracy. The Ephoralty certainly does keep the state together; for the people are contented when they have a share in the highest office, and the result, whether due to the legislator or to chance, has been advantageous. For if a constitution is to be permanent, all the parts of the state must wish that it should exist and the same arrangements be maintained. This is the case at Sparta, where the kings desire its permanence because they have due honor in their own persons; the nobles because they are represented in the council of elders (for the office of elder is a reward of virtue); and the people, because all are eligible to the Ephoralty. The election of Ephors out of the whole people is perfectly right, but ought not to be carried on in the present fashion, which is too childish. Again, they have the decision of great causes, although they are quite

ordinary men, and therefore they should not determine them merely on their own judgment, but according to written rules, and to the laws. Their way of life, too, is not in accordance with the spirit of the constitution – they have a deal too much license; whereas, in the case of the other citizens, the excess of strictness is so intolerable that they run away from the law into the secret indulgence of sensual pleasures.

Again, the council of elders is not free from defects. It may be said that the elders are good men and well trained in manly virtue; and that, therefore, there is an advantage to the state in having them. But that judges of important causes should hold office for life is a disputable thing, for the mind grows old as well as the body. And when men have been educated in such a manner that even the legislator himself cannot trust them, there is real danger. Many of the elders are well known to have taken bribes and to have been guilty of partiality in public affairs. And therefore they ought not to be irresponsible; yet at Sparta they are so. But (it may be replied), 'All magistracies are accountable to the Ephors.' Yes, but this prerogative is too great for them, and we maintain that the control should be exercised in some other manner. Further, the mode in which the Spartans elect their elders is childish; and it is improper that the person to be elected should canvass for the office; the worthiest should be appointed, whether he chooses or not. And here the legislator clearly indicates the same intention which appears in other parts of his constitution; he would have his citizens ambitious, and he has reckoned upon this quality in the election of the elders; for no one would ask to be elected if he were not. Yet ambition and avarice, almost more than any other passions, are the motives of crime.

Whether kings are or are not an advantage to states, I will consider at another time; they should at any rate be chosen, not as they are now, but with regard to their personal life and

conduct. The legislator himself obviously did not suppose that he could make them really good men; at least he shows a great distrust of their virtue. For this reason the Spartans used to join enemies with them in the same embassy, and the quarrels between the kings were held to be conservative of the state.

Neither did the first introducer of the common meals, called 'phiditia,' regulate them well. The entertainment ought to have been provided at the public cost, as in Crete; but among the Lacedaemonians every one is expected to contribute, and some of them are too poor to afford the expense; thus the intention of the legislator is frustrated. The common meals were meant to be a popular institution, but the existing manner of regulating them is the reverse of popular. For the very poor can scarcely take part in them; and, according to ancient custom, those who cannot contribute are not allowed to retain their rights of citizenship.

The law about the Spartan admirals has often been censured, and with justice; it is a source of dissension, for the kings are perpetual generals, and this office of admiral is but the setting up of another king.

The charge which Plato brings, in the Laws, against the intention of the legislator, is likewise justified; the whole constitution has regard to one part of virtue only – the virtue of the soldier, which gives victory in war. So long as they were at war, therefore, their power was preserved, but when they had attained empire they fell for of the arts of peace they knew nothing, and had never engaged in any employment higher than war. There is another error, equally great, into which they have fallen. Although they truly think that the goods for which men contend are to be acquired by virtue rather than by vice, they err in supposing that these goods are to be preferred to the virtue which gains them.

Once more: the revenues of the state are ill-managed; there is no money in the treasury, although they are obliged to carry on great wars, and they are unwilling to pay taxes. The greater part of the land being in the hands of the Spartans, they do not look closely into one another's contributions. The result which the legislator has produced is the reverse of beneficial; for he has made his city poor, and his citizens greedy.

Enough respecting the Spartan constitution, of which these are the principal defects.

10

The Cretan constitution nearly resembles the Spartan, and in some few points is quite as good; but for the most part less perfect in form. The older constitutions are generally less elaborate than the later, and the Lacedaemonian is said to be, and probably is, in a very great measure, a copy of the Cretan. According to tradition, Lycurgus, when he ceased to be the guardian of King Charillus, went abroad and spent most of his time in Crete. For the two countries are nearly connected; the Lyctians are a colony of the Lacedaemonians, and the colonists, when they came to Crete, adopted the constitution which they found existing among the inhabitants. Even to this day the Perioeci, or subject population of Crete, are governed by the original laws which Minos is supposed to have enacted. The island seems to be intended by nature for dominion in Hellas, and to be well situated; it extends right across the sea, around which nearly all the Hellenes are settled; and while one end is not far from the Peloponnese, the other almost reaches to the region of Asia about Triopium and Rhodes. Hence Minos acquired the empire of the sea, subduing some of the islands

and colonizing others; at last he invaded Sicily, where he died near Camicus.

The Cretan institutions resemble the Lacedaemonian. The Helots are the husbandmen of the one, the Perioeci of the other, and both Cretans and Lacedaemonians have common meals, which were anciently called by the Lacedaemonians not 'phiditia' but 'andria'; and the Cretans have the same word, the use of which proves that the common meals originally came from Crete. Further, the two constitutions are similar; for the office of the Ephors is the same as that of the Cretan Cosmi, the only difference being that whereas the Ephors are five, the Cosmi are ten in number. The elders, too, answer to the elders in Crete, who are termed by the Cretans the council. And the kingly office once existed in Crete, but was abolished, and the Cosmi have now the duty of leading them in war. All classes share in the ecclesia, but it can only ratify the decrees of the elders and the Cosmi.

The common meals of Crete are certainly better managed than the Lacedaemonian; for in Lacedaemon every one pays so much per head, or, if he fails, the law, as I have already explained, forbids him to exercise the rights of citizenship. But in Crete they are of a more popular character. There, of all the fruits of the earth and cattle raised on the public lands, and of the tribute which is paid by the Perioeci, one portion is assigned to the Gods and to the service of the state, and another to the common meals, so that men, women, and children are all supported out of a common stock. The legislator has many ingenious ways of securing moderation in eating, which he conceives to be a gain; he likewise encourages the separation of men from women, lest they should have too many children, and the companionship of men with one another – whether this is a good or bad thing I shall have an opportunity of considering at

another time. But that the Cretan common meals are better ordered than the Lacedaemonian there can be no doubt.

On the other hand, the Cosmi are even a worse institution than the Ephors, of which they have all the evils without the good. Like the Ephors, they are any chance persons, but in Crete this is not counterbalanced by a corresponding political advantage. At Sparta every one is eligible, and the body of the people, having a share in the highest office, want the constitution to be permanent. But in Crete the Cosmi are elected out of certain families, and not out of the whole people, and the elders out of those who have been Cosmi.

The same criticism may be made about the Cretan, which has been already made about the Lacedaemonian elders. Their irresponsibility and life tenure is too great a privilege, and their arbitrary power of acting upon their own judgment, and dispensing with written law, is dangerous. It is no proof of the goodness of the institution that the people are not discontented at being excluded from it. For there is no profit to be made out of the office as out of the Ephoralty, since, unlike the Ephors, the Cosmi, being in an island, are removed from temptation.

The remedy by which they correct the evil of this institution is an extraordinary one, suited rather to a close oligarchy than to a constitutional state. For the Cosmi are often expelled by a conspiracy of their own colleagues, or of private individuals; and they are allowed also to resign before their term of office has expired. Surely all matters of this kind are better regulated by law than by the will of man, which is a very unsafe rule. Worst of all is the suspension of the office of Cosmi, a device to which the nobles often have recourse when they will not submit to justice. This shows that the Cretan government, although possessing some of the characteristics of a constitutional state, is really a close oligarchy.

The nobles have a habit, too, of setting up a chief; they get together a party among the common people and their own friends and then quarrel and fight with one another. What is this but the temporary destruction of the state and dissolution of society? A city is in a dangerous condition when those who are willing are also able to attack her. But, as I have already said, the island of Crete is saved by her situation; distance has the same effect as the Lacedaemonian prohibition of strangers; and the Cretans have no foreign dominions. This is the reason why the Perioeci are contented in Crete, whereas the Helots are perpetually revolting. But when lately foreign invaders found their way into the island, the weakness of the Cretan constitution was revealed. Enough of the government of Crete.

11

The Carthaginians are also considered to have an excellent form of government, which differs from that of any other state in several respects, though it is in some very like the Lacedaemonian. Indeed, all three states – the Lacedaemonian, the Cretan, and the Carthaginian – nearly resemble one another, and are very different from any others. Many of the Carthaginian institutions are excellent The superiority of their constitution is proved by the fact that the common people remain loyal to the constitution the Carthaginians have never had any rebellion worth speaking of, and have never been under the rule of a tyrant.

Among the points in which the Carthaginian constitution resembles the Lacedaemonian are the following: The common tables of the clubs answer to the Spartan phiditia, and their magistracy of the 104 to the Ephors; but, whereas the Ephors are

any chance persons, the magistrates of the Carthaginians are elected according to merit – this is an improvement. They have also their kings and their gerusia, or council of elders, who correspond to the kings and elders of Sparta. Their kings, unlike the Spartan, are not always of the same family, nor that an ordinary one, but if there is some distinguished family they are selected out of it and not appointed by senority – this is far better. Such officers have great power, and therefore, if they are persons of little worth, do a great deal of harm, and they have already done harm at Lacedaemon.

Most of the defects or deviations from the perfect state, for which the Carthaginian constitution would be censured, apply equally to all the forms of government which we have mentioned. But of the deflections from aristocracy and constitutional government, some incline more to democracy and some to oligarchy. The kings and elders, if unanimous, may determine whether they will or will not bring a matter before the people, but when they are not unanimous, the people decide on such matters as well. And whatever the kings and elders bring before the people is not only heard but also determined by them, and any one who likes may oppose it; now this is not permitted in Sparta and Crete. That the magistrates of five who have under them many important matters should be co-opted, that they should choose the supreme council of 100, and should hold office longer than other magistrates (for they are virtually rulers both before and after they hold office) – these are oligarchical features; their being without salary and not elected by lot, and any similar points, such as the practice of having all suits tried by the magistrates, and not some by one class of judges or jurors and some by another, as at Lacedaemon, are characteristic of aristocracy. The Carthaginian constitution deviates from aristocracy and inclines to oligarchy, chiefly on a point where popular opinion is on their side. For men in general think that magistrates should be chosen not

only for their merit, but for their wealth: a man, they say, who is poor cannot rule well – he has not the leisure. If, then, election of magistrates for their wealth be characteristic of oligarchy, and election for merit of aristocracy, there will be a third form under which the constitution of Carthage is comprehended; for the Carthaginians choose their magistrates, and particularly the highest of them – their kings and generals – with an eye both to merit and to wealth.

But we must acknowledge that, in thus deviating from aristocracy, the legislator has committed an error. Nothing is more absolutely necessary than to provide that the highest class, not only when in office, but when out of office, should have leisure and not disgrace themselves in any way; and to this his attention should be first directed. Even if you must have regard to wealth, in order to secure leisure, yet it is surely a bad thing that the greatest offices, such as those of kings and generals, should be bought. The law which allows this abuse makes wealth of more account than virtue, and the whole state becomes avaricious. For, whenever the chiefs of the state deem anything honorable, the other citizens are sure to follow their example; and, where virtue has not the first place, their aristocracy cannot be firmly established. Those who have been at the expense of purchasing their places will be in the habit of repaying themselves; and it is absurd to suppose that a poor and honest man will be wanting to make gains, and that a lower stamp of man who has incurred a great expense will not. Wherefore they should rule who are able to rule best. And even if the legislator does not care to protect the good from poverty, he should at any rate secure leisure for them when in office.

It would seem also to be a bad principle that the same person should hold many offices, which is a favorite practice among the Carthaginians, for one business is better done by one man. The legislator should see to this and should not appoint the

same person to be a flute-player and a shoemaker. Hence, where the state is large, it is more in accordance both with constitutional and with democratic principles that the offices of state should be distributed among many persons. For, as I said, this arrangement is fairer to all, and any action familiarized by repetition is better and sooner performed. We have a proof in military and naval matters; the duties of command and of obedience in both these services extend to all.

The government of the Carthaginians is oligarchical, but they successfully escape the evils of oligarchy by enriching one portion of the people after another by sending them to their colonies. This is their panacea and the means by which they give stability to the state. Accident favors them, but the legislator should be able to provide against revolution without trusting to accidents. As things are, if any misfortune occurred, and the bulk of the subjects revolted, there would be no way of restoring peace by legal methods.

Such is the character of the Lacedaemonian, Cretan, and Carthaginian constitutions, which are justly celebrated.

12

Of those who have treated of governments, some have never taken any part at all in public affairs, but have passed their lives in a private station; about most of them, what was worth telling has been already told. Others have been lawgivers, either in their own or in foreign cities, whose affairs they have administered; and of these some have only made laws, others have framed constitutions; for example, Lycurgus and Solon did both. Of the Lacedaemonian constitution I have already spoken. As to Solon, he is thought by some to have been a good

legislator, who put an end to the exclusiveness of the oligarchy, emancipated the people, established the ancient Athenian democracy, and harmonized the different elements of the state. According to their view, the council of Areopagus was an oligarchical element, the elected magistracy, aristocratical, and the courts of law, democratical. The truth seems to be that the council and the elected magistracy existed before the time of Solon, and were retained by him, but that he formed the courts of law out of an the citizens, thus creating the democracy, which is the very reason why he is sometimes blamed. For in giving the supreme power to the law courts, which are elected by lot, he is thought to have destroyed the non-democratic element. When the law courts grew powerful, to please the people who were now playing the tyrant the old constitution was changed into the existing democracy. Ephialtes and Pericles curtailed the power of the Areopagus; Pericles also instituted the payment of the juries, and thus every demagogue in turn increased the power of the democracy until it became what we now see. All this is true; it seems, however, to be the result of circumstances, and not to have been intended by Solon. For the people, having been instrumental in gaining the empire of the sea in the Persian War, began to get a notion of itself, and followed worthless demagogues, whom the better class opposed. Solon, himself, appears to have given the Athenians only that power of electing to offices and calling to account the magistrates which was absolutely necessary; for without it they would have been in a state of slavery and enmity to the government. All the magistrates he appointed from the notables and the men of wealth, that is to say, from the pentacosio-medimni, or from the class called zeugitae, or from a third class of so-called knights or cavalry. The fourth class were laborers who had no share in any magistracy.

Mere legislators were Zaleucus, who gave laws to the Epizephyrian Locrians, and Charondas, who legislated for his

own city of Catana, and for the other Chalcidian cities in Italy and Sicily. Some people attempt to make out that Onomacritus was the first person who had any special skill in legislation, and that he, although a Locrian by birth, was trained in Crete, where he lived in the exercise of his prophetic art; that Thales was his companion, and that Lycurgus and Zaleucus were disciples of Thales, as Charondas was of Zaleucus. But their account is quite inconsistent with chronology.

There was also Philolaus, the Corinthian, who gave laws to the Thebans. This Philolaus was one of the family of the Bacchiadae, and a lover of Diocles, the Olympic victor, who left Corinth in horror of the incestuous passion which his mother Halcyone had conceived for him, and retired to Thebes, where the two friends together ended their days. The inhabitants still point out their tombs, which are in full view of one another, but one is visible from the Corinthian territory, the other not. Tradition says the two friends arranged them thus, Diocles out of horror at his misfortunes, so that the land of Corinth might not be visible from his tomb; Philolaus that it might. This is the reason why they settled at Thebes, and so Philolaus legislated for the Thebans, and, besides some other enactments, gave them laws about the procreation of children, which they call the 'Laws of Adoption.' These laws were peculiar to him, and were intended to preserve the number of the lots.

In the legislation of Charondas there is nothing remarkable, except the suits against false witnesses. He is the first who instituted denunciation for perjury. His laws are more exact and more precisely expressed than even those of our modern legislators.

(Characteristic of Phaleas is the equalization of property; of Plato, the community of women, children, and property, the common meals of women, and the law about drinking, that the

sober shall be masters of the feast; also the training of soldiers to acquire by practice equal skill with both hands, so that one should be as useful as the other.)

Draco has left laws, but he adapted them to a constitution which already existed, and there is no peculiarity in them which is worth mentioning, except the greatness and severity of the punishments.

Pittacus, too, was only a lawgiver, and not the author of a constitution; he has a law which is peculiar to him, that, if a drunken man do something wrong, he shall be more heavily punished than if he were sober; he looked not to the excuse which might be offered for the drunkard, but only to expediency, for drunken more often than sober people commit acts of violence.

Androdamas of Rhegium gave laws to the Chalcidians of Thrace. Some of them relate to homicide, and to heiresses; but there is nothing remarkable in them.

And here let us conclude our inquiry into the various constitutions which either actually exist, or have been devised by theorists.

Book III

1

He who would inquire into the essence and attributes of various kinds of governments must first of all determine 'What is a state?' At present this is a disputed question. Some say that the state has done a certain act; others, no, not the state, but the oligarchy or the tyrant. And the legislator or statesman is concerned entirely with the state; a constitution or government being an arrangement of the inhabitants of a state. But a state is composite, like any other whole made up of many parts; these are the citizens, who compose it. It is evident, therefore, that we must begin by asking, Who is the citizen, and what is the meaning of the term? For here again there may be a difference of opinion. He who is a citizen in a democracy will often not be a citizen in an oligarchy. Leaving out of consideration those who have been made citizens, or who have obtained the name of citizen any other accidental manner, we may say, first, that a citizen is not a citizen because he lives in a certain place, for resident aliens and slaves share in the place; nor is he a citizen who has no legal right except that of suing and being sued; for this right may be enjoyed under the provisions of a treaty. Nay, resident aliens in many places do not possess even such rights completely, for they are obliged to have a patron, so that they do but imperfectly participate in citizenship, and we call them citizens only in a qualified sense, as we might apply the term to children who are too young to be on the register, or to old men who have been relieved from state duties. Of these we do not say quite simply that they are citizens, but add in the one case that they are not of age, and in the other, that they are past the age, or something of that sort; the precise expression is

immaterial, for our meaning is clear. Similar difficulties to those which I have mentioned may be raised and answered about deprived citizens and about exiles. But the citizen whom we are seeking to define is a citizen in the strictest sense, against whom no such exception can be taken, and his special characteristic is that he shares in the administration of justice, and in offices. Now of offices some are discontinuous, and the same persons are not allowed to hold them twice, or can only hold them after a fixed interval; others have no limit of time – for example, the office of a dicast or ecclesiast. It may, indeed, be argued that these are not magistrates at all, and that their functions give them no share in the government. But surely it is ridiculous to say that those who have the power do not govern. Let us not dwell further upon this, which is a purely verbal question; what we want is a common term including both dicast and ecclesiast. Let us, for the sake of distinction, call it 'indefinite office,' and we will assume that those who share in such office are citizens. This is the most comprehensive definition of a citizen, and best suits all those who are generally so called.

But we must not forget that things of which the underlying principles differ in kind, one of them being first, another second, another third, have, when regarded in this relation, nothing, or hardly anything, worth mentioning in common. Now we see that governments differ in kind, and that some of them are prior and that others are posterior; those which are faulty or perverted are necessarily posterior to those which are perfect. (What we mean by perversion will be hereafter explained.) The citizen then of necessity differs under each form of government; and our definition is best adapted to the citizen of a democracy; but not necessarily to other states. For in some states the people are not acknowledged, nor have they any regular assembly, but only extraordinary ones; and suits are distributed by sections among the magistrates. At Lacedaemon,

for instance, the Ephors determine suits about contracts, which they distribute among themselves, while the elders are judges of homicide, and other causes are decided by other magistrates. A similar principle prevails at Carthage; there certain magistrates decide all causes. We may, indeed, modify our definition of the citizen so as to include these states. In them it is the holder of a definite, not of an indefinite office, who legislates and judges, and to some or all such holders of definite offices is reserved the right of deliberating or judging about some things or about all things. The conception of the citizen now begins to clear up.

He who has the power to take part in the deliberative or judicial administration of any state is said by us to be a citizens of that state; and, speaking generally, a state is a body of citizens sufficing for the purposes of life.

2

But in practice a citizen is defined to be one of whom both the parents are citizens; others insist on going further back; say to two or three or more ancestors. This is a short and practical definition but there are some who raise the further question: How this third or fourth ancestor came to be a citizen? Gorgias of Leontini, partly because he was in a difficulty, partly in irony, said – 'Mortars are what is made by the mortar-makers, and the citizens of Larissa are those who are made by the magistrates; for it is their trade to make Larissaeans.' Yet the question is really simple, for, if according to the definition just given they shared in the government, they were citizens. This is a better definition than the other. For the words, 'born of a father or

mother who is a citizen,' cannot possibly apply to the first inhabitants or founders of a state.

There is a greater difficulty in the case of those who have been made citizens after a revolution, as by Cleisthenes at Athens after the expulsion of the tyrants, for he enrolled in tribes many metics, both strangers and slaves. The doubt in these cases is, not who is, but whether he who is ought to be a citizen; and there will still be a furthering the state, whether a certain act is or is not an act of the state; for what ought not to be is what is false. Now, there are some who hold office, and yet ought not to hold office, whom we describe as ruling, but ruling unjustly. And the citizen was defined by the fact of his holding some kind of rule or office – he who holds a judicial or legislative office fulfills our definition of a citizen. It is evident, therefore, that the citizens about whom the doubt has arisen must be called citizens.

3

Whether they ought to be so or not is a question which is bound up with the previous inquiry. For a parallel question is raised respecting the state, whether a certain act is or is not an act of the state; for example, in the transition from an oligarchy or a tyranny to a democracy. In such cases persons refuse to fulfill their contracts or any other obligations, on the ground that the tyrant, and not the state, contracted them; they argue that some constitutions are established by force, and not for the sake of the common good. But this would apply equally to democracies, for they too may be founded on violence, and then the acts of the democracy will be neither more nor less acts of the state in question than those of an oligarchy or of a tyranny. This

question runs up into another: on what principle shall we ever say that the state is the same, or different? It would be a very superficial view which considered only the place and the inhabitants (for the soil and the population may be separated, and some of the inhabitants may live in one place and some in another). This, however, is not a very serious difficulty; we need only remark that the word 'state' is ambiguous.

It is further asked: When are men, living in the same place, to be regarded as a single city – what is the limit? Certainly not the wall of the city, for you might surround all Peloponnesus with a wall. Like this, we may say, is Babylon, and every city that has the compass of a nation rather than a city; Babylon, they say, had been taken for three days before some part of the inhabitants became aware of the fact. This difficulty may, however, with advantage be deferred to another occasion; the statesman has to consider the size of the state, and whether it should consist of more than one nation or not.

Again, shall we say that while the race of inhabitants, as well as their place of abode, remain the same, the city is also the same, although the citizens are always dying and being born, as we call rivers and fountains the same, although the water is always flowing away and coming again Or shall we say that the generations of men, like the rivers, are the same, but that the state changes? For, since the state is a partnership, and is a partnership of citizens in a constitution, when the form of government changes, and becomes different, then it may be supposed that the state is no longer the same, just as a tragic differs from a comic chorus, although the members of both may be identical. And in this manner we speak of every union or composition of elements as different when the form of their composition alters; for example, a scale containing the same sounds is said to be different, accordingly as the Dorian or the Phrygian mode is employed. And if this is true it is evident that

the sameness of the state consists chiefly in the sameness of the constitution, and it may be called or not called by the same name, whether the inhabitants are the same or entirely different. It is quite another question, whether a state ought or ought not to fulfill engagements when the form of government changes.

4

There is a point nearly allied to the preceding: Whether the virtue of a good man and a good citizen is the same or not. But, before entering on this discussion, we must certainly first obtain some general notion of the virtue of the citizen. Like the sailor, the citizen is a member of a community. Now, sailors have different functions, for one of them is a rower, another a pilot, and a third a look-out man, a fourth is described by some similar term; and while the precise definition of each individual's virtue applies exclusively to him, there is, at the same time, a common definition applicable to them all. For they have all of them a common object, which is safety in navigation. Similarly, one citizen differs from another, but the salvation of the community is the common business of them all. This community is the constitution; the virtue of the citizen must therefore be relative to the constitution of which he is a member. If, then, there are many forms of government, it is evident that there is not one single virtue of the good citizen which is perfect virtue. But we say that the good man is he who has one single virtue which is perfect virtue. Hence it is evident that the good citizen need not of necessity possess the virtue which makes a good man.

The same question may also be approached by another road, from a consideration of the best constitution. If the state cannot be entirely composed of good men, and yet each citizen is expected to do his own business well, and must therefore have virtue, still inasmuch as all the citizens cannot be alike, the virtue of the citizen and of the good man cannot coincide. All must have the virtue of the good citizen – thus, and thus only, can the state be perfect; but they will not have the virtue of a good man, unless we assume that in the good state all the citizens must be good.

Again, the state, as composed of unlikes, may be compared to the living being: as the first elements into which a living being is resolved are soul and body, as soul is made up of rational principle and appetite, the family of husband and wife, property of master and slave, so of all these, as well as other dissimilar elements, the state is composed; and, therefore, the virtue of all the citizens cannot possibly be the same, any more than the excellence of the leader of a chorus is the same as that of the performer who stands by his side. I have said enough to show why the two kinds of virtue cannot be absolutely and always the same.

But will there then be no case in which the virtue of the good citizen and the virtue of the good man coincide? To this we answer that the good ruler is a good and wise man, and that he who would be a statesman must be a wise man. And some persons say that even the education of the ruler should be of a special kind; for are not the children of kings instructed in riding and military exercises? As Euripides says:

No subtle arts for me, but what the state requires.

As though there were a special education needed by a ruler. If then the virtue of a good ruler is the same as that of a good man, and we assume further that the subject is a citizen as well

as the ruler, the virtue of the good citizen and the virtue of the good man cannot be absolutely the same, although in some cases they may; for the virtue of a ruler differs from that of a citizen. It was the sense of this difference which made Jason say that 'he felt hungry when he was not a tyrant,' meaning that he could not endure to live in a private station. But, on the other hand, it may be argued that men are praised for knowing both how to rule and how to obey, and he is said to be a citizen of approved virtue who is able to do both. Now if we suppose the virtue of a good man to be that which rules, and the virtue of the citizen to include ruling and obeying, it cannot be said that they are equally worthy of praise. Since, then, it is sometimes thought that the ruler and the ruled must learn different things and not the same, but that the citizen must know and share in them both, the inference is obvious. There is, indeed, the rule of a master, which is concerned with menial offices – the master need not know how to perform these, but may employ others in the execution of them: the other would be degrading; and by the other I mean the power actually to do menial duties, which vary much in character and are executed by various classes of slaves, such, for example, as handicraftsmen, who, as their name signifies, live by the labor of their hands: under these the mechanic is included. Hence in ancient times, and among some nations, the working classes had no share in the government – a privilege which they only acquired under the extreme democracy. Certainly the good man and the statesman and the good citizen ought not to learn the crafts of inferiors except for their own occasional use; if they habitually practice them, there will cease to be a distinction between master and slave.

This is not the rule of which we are speaking; but there is a rule of another kind, which is exercised over freemen and equals by birth – a constitutional rule, which the ruler must learn by obeying, as he would learn the duties of a general of cavalry by being under the orders of a general of cavalry, or the duties of a

general of infantry by being under the orders of a general of infantry, and by having had the command of a regiment and of a company. It has been well said that 'he who has never learned to obey cannot be a good commander.' The two are not the same, but the good citizen ought to be capable of both; he should know how to govern like a freeman, and how to obey like a freeman – these are the virtues of a citizen. And, although the temperance and justice of a ruler are distinct from those of a subject, the virtue of a good man will include both; for the virtue of the good man who is free and also a subject, e.g., his justice, will not be one but will comprise distinct kinds, the one qualifying him to rule, the other to obey, and differing as the temperance and courage of men and women differ. For a man would be thought a coward if he had no more courage than a courageous woman, and a woman would be thought loquacious if she imposed no more restraint on her conversation than the good man; and indeed their part in the management of the household is different, for the duty of the one is to acquire, and of the other to preserve. Practical wisdom only is characteristic of the ruler: it would seem that all other virtues must equally belong to ruler and subject. The virtue of the subject is certainly not wisdom, but only true opinion; he may be compared to the maker of the flute, while his master is like the flute-player or user of the flute.

From these considerations may be gathered the answer to the question, whether the virtue of the good man is the same as that of the good citizen, or different, and how far the same, and how far different.

5

There still remains one more question about the citizen: Is he only a true citizen who has a share of office, or is the mechanic to be included? If they who hold no office are to be deemed citizens, not every citizen can have this virtue of ruling and obeying; for this man is a citizen And if none of the lower class are citizens, in which part of the state are they to be placed? For they are not resident aliens, and they are not foreigners. May we not reply, that as far as this objection goes there is no more absurdity in excluding them than in excluding slaves and freedmen from any of the above-mentioned classes? It must be admitted that we cannot consider all those to be citizens who are necessary to the existence of the state; for example, children are not citizen equally with grown-up men, who are citizens absolutely, but children, not being grown up, are only citizens on a certain assumption. Nay, in ancient times, and among some nations the artisan class were slaves or foreigners, and therefore the majority of them are so now. The best form of state will not admit them to citizenship; but if they are admitted, then our definition of the virtue of a citizen will not apply to every citizen nor to every free man as such, but only to those who are freed from necessary services. The necessary people are either slaves who minister to the wants of individuals, or mechanics and laborers who are the servants of the community. These reflections carried a little further will explain their position; and indeed what has been said already is of itself, when understood, explanation enough.

Since there are many forms of government there must be many varieties of citizen and especially of citizens who are subjects; so that under some governments the mechanic and the laborer will be citizens, but not in others, as, for example, in aristocracy or the so-called government of the best (if there be such an one), in which honors are given according to virtue and merit;

for no man can practice virtue who is living the life of a mechanic or laborer. In oligarchies the qualification for office is high, and therefore no laborer can ever be a citizen; but a mechanic may, for an actual majority of them are rich. At Thebes there was a law that no man could hold office who had not retired from business for ten years. But in many states the law goes to the length of admitting aliens; for in some democracies a man is a citizen though his mother only be a citizen; and a similar principle is applied to illegitimate children; the law is relaxed when there is a dearth of population. But when the number of citizens increases, first the children of a male or a female slave are excluded; then those whose mothers only are citizens; and at last the right of citizenship is confined to those whose fathers and mothers are both citizens.

Hence, as is evident, there are different kinds of citizens; and he is a citizen in the highest sense who shares in the honors of the state. Compare Homer's words, 'like some dishonored stranger'; he who is excluded from the honors of the state is no better than an alien. But when his exclusion is concealed, then the object is that the privileged class may deceive their fellow inhabitants.

As to the question whether the virtue of the good man is the same as that of the good citizen, the considerations already adduced prove that in some states the good man and the good citizen are the same, and in others different. When they are the same it is not every citizen who is a good man, but only the statesman and those who have or may have, alone or in conjunction with others, the conduct of public affairs.

6

Having determined these questions, we have next to consider whether there is only one form of government or many, and if many, what they are, and how many, and what are the differences between them.

A constitution is the arrangement of magistracies in a state, especially of the highest of all. The government is everywhere sovereign in the state, and the constitution is in fact the government. For example, in democracies the people are supreme, but in oligarchies, the few; and, therefore, we say that these two forms of government also are different: and so in other cases.

First, let us consider what is the purpose of a state, and how many forms of government there are by which human society is regulated. We have already said, in the first part of this treatise, when discussing household management and the rule of a master, that man is by nature a political animal. And therefore, men, even when they do not require one another's help, desire to live together; not but that they are also brought together by their common interests in proportion as they severally attain to any measure of well-being. This is certainly the chief end, both of individuals and of states. And also for the sake of mere life (in which there is possibly some noble element so long as the evils of existence do not greatly overbalance the good) mankind meet together and maintain the political community. And we all see that men cling to life even at the cost of enduring great misfortune, seeming to find in life a natural sweetness and happiness.

There is no difficulty in distinguishing the various kinds of authority; they have been often defined already in discussions outside the school. The rule of a master, although the slave by nature and the master by nature have in reality the same

interests, is nevertheless exercised primarily with a view to the interest of the master, but accidentally considers the slave, since, if the slave perish, the rule of the master perishes with him. On the other hand, the government of a wife and children and of a household, which we have called household management, is exercised in the first instance for the good of the governed or for the common good of both parties, but essentially for the good of the governed, as we see to be the case in medicine, gymnastic, and the arts in general, which are only accidentally concerned with the good of the artists themselves. For there is no reason why the trainer may not sometimes practice gymnastics, and the helmsman is always one of the crew. The trainer or the helmsman considers the good of those committed to his care. But, when he is one of the persons taken care of, he accidentally participates in the advantage, for the helmsman is also a sailor, and the trainer becomes one of those in training. And so in politics: when the state is framed upon the principle of equality and likeness, the citizens think that they ought to hold office by turns. Formerly, as is natural, every one would take his turn of service; and then again, somebody else would look after his interest, just as he, while in office, had looked after theirs. But nowadays, for the sake of the advantage which is to be gained from the public revenues and from office, men want to be always in office. One might imagine that the rulers, being sickly, were only kept in health while they continued in office; in that case we may be sure that they would be hunting after places. The conclusion is evident: that governments which have a regard to the common interest are constituted in accordance with strict principles of justice, and are therefore true forms; but those which regard only the interest of the rulers are all defective and perverted forms, for they are despotic, whereas a state is a community of freemen.

7

Having determined these points, we have next to consider how many forms of government there are, and what they are; and in the first place what are the true forms, for when they are determined the perversions of them will at once be apparent. The words constitution and government have the same meaning, and the government, which is the supreme authority in states, must be in the hands of one, or of a few, or of the many. The true forms of government, therefore, are those in which the one, or the few, or the many, govern with a view to the common interest; but governments which rule with a view to the private interest, whether of the one or of the few, or of the many, are perversions. For the members of a state, if they are truly citizens, ought to participate in its advantages. Of forms of government in which one rules, we call that which regards the common interests, kingship or royalty; that in which more than one, but not many, rule, aristocracy; and it is so called, either because the rulers are the best men, or because they have at heart the best interests of the state and of the citizens. But when the citizens at large administer the state for the common interest, the government is called by the generic name – a constitution. And there is a reason for this use of language. One man or a few may excel in virtue; but as the number increases it becomes more difficult for them to attain perfection in every kind of virtue, though they may in military virtue, for this is found in the masses. Hence in a constitutional government the fighting-men have the supreme power, and those who possess arms are the citizens.

Of the above-mentioned forms, the perversions are as follows: of royalty, tyranny; of aristocracy, oligarchy; of constitutional government, democracy. For tyranny is a kind of monarchy

which has in view the interest of the monarch only; oligarchy has in view the interest of the wealthy; democracy, of the needy: none of them the common good of all.

8

But there are difficulties about these forms of government, and it will therefore be necessary to state a little more at length the nature of each of them. For he who would make a philosophical study of the various sciences, and does not regard practice only, ought not to overlook or omit anything, but to set forth the truth in every particular. Tyranny, as I was saying, is monarchy exercising the rule of a master over the political society; oligarchy is when men of property have the government in their hands; democracy, the opposite, when the indigent, and not the men of property, are the rulers. And here arises the first of our difficulties, and it relates to the distinction drawn. For democracy is said to be the government of the many. But what if the many are men of property and have the power in their hands? In like manner oligarchy is said to be the government of the few; but what if the poor are fewer than the rich, and have the power in their hands because they are stronger? In these cases the distinction which we have drawn between these different forms of government would no longer hold good.

Suppose, once more, that we add wealth to the few and poverty to the many, and name the governments accordingly – an oligarchy is said to be that in which the few and the wealthy, and a democracy that in which the many and the poor are the rulers – there will still be a difficulty. For, if the only forms of government are the ones already mentioned, how shall we describe those other governments also just mentioned by us, in

which the rich are the more numerous and the poor are the fewer, and both govern in their respective states?

The argument seems to show that, whether in oligarchies or in democracies, the number of the governing body, whether the greater number, as in a democracy, or the smaller number, as in an oligarchy, is an accident due to the fact that the rich everywhere are few, and the poor numerous. But if so, there is a misapprehension of the causes of the difference between them. For the real difference between democracy and oligarchy is poverty and wealth. Wherever men rule by reason of their wealth, whether they be few or many, that is an oligarchy, and where the poor rule, that is a democracy. But as a fact the rich are few and the poor many; for few are well-to-do, whereas freedom is enjoyed by an, and wealth and freedom are the grounds on which the oligarchical and democratical parties respectively claim power in the state.

9

Let us begin by considering the common definitions of oligarchy and democracy, and what is justice oligarchical and democratical. For all men cling to justice of some kind, but their conceptions are imperfect and they do not express the whole idea. For example, justice is thought by them to be, and is, equality, not. however, for however, for but only for equals. And inequality is thought to be, and is, justice; neither is this for all, but only for unequals. When the persons are omitted, then men judge erroneously. The reason is that they are passing judgment on themselves, and most people are bad judges in their own case. And whereas justice implies a relation to persons as well as to things, and a just distribution, as I have already said in the

Ethics, implies the same ratio between the persons and between the things, they agree about the equality of the things, but dispute about the equality of the persons, chiefly for the reason which I have just given – because they are bad judges in their own affairs; and secondly, because both the parties to the argument are speaking of a limited and partial justice, but imagine themselves to be speaking of absolute justice. For the one party, if they are unequal in one respect, for example wealth, consider themselves to be unequal in all; and the other party, if they are equal in one respect, for example free birth, consider themselves to be equal in all. But they leave out the capital point. For if men met and associated out of regard to wealth only, their share in the state would be proportioned to their property, and the oligarchical doctrine would then seem to carry the day. It would not be just that he who paid one mina should have the same share of a hundred minae, whether of the principal or of the profits, as he who paid the remaining ninety-nine. But a state exists for the sake of a good life, and not for the sake of life only: if life only were the object, slaves and brute animals might form a state, but they cannot, for they have no share in happiness or in a life of free choice. Nor does a state exist for the sake of alliance and security from injustice, nor yet for the sake of exchange and mutual intercourse; for then the Tyrrhenians and the Carthaginians, and all who have commercial treaties with one another, would be the citizens of one state. True, they have agreements about imports, and engagements that they will do no wrong to one another, and written articles of alliance. But there are no magistrates common to the contracting parties who will enforce their engagements; different states have each their own magistracies. Nor does one state take care that the citizens of the other are such as they ought to be, nor see that those who come under the terms of the treaty do no wrong or wickedness at an, but only that they do no injustice to one another. Whereas, those

who care for good government take into consideration virtue and vice in states. Whence it may be further inferred that virtue must be the care of a state which is truly so called, and not merely enjoys the name: for without this end the community becomes a mere alliance which differs only in place from alliances of which the members live apart; and law is only a convention, 'a surety to one another of justice,' as the sophist Lycophron says, and has no real power to make the citizens

This is obvious; for suppose distinct places, such as Corinth and Megara, to be brought together so that their walls touched, still they would not be one city, not even if the citizens had the right to intermarry, which is one of the rights peculiarly characteristic of states. Again, if men dwelt at a distance from one another, but not so far off as to have no intercourse, and there were laws among them that they should not wrong each other in their exchanges, neither would this be a state. Let us suppose that one man is a carpenter, another a husbandman, another a shoemaker, and so on, and that their number is ten thousand: nevertheless, if they have nothing in common but exchange, alliance, and the like, that would not constitute a state. Why is this? Surely not because they are at a distance from one another: for even supposing that such a community were to meet in one place, but that each man had a house of his own, which was in a manner his state, and that they made alliance with one another, but only against evil-doers; still an accurate thinker would not deem this to be a state, if their intercourse with one another was of the same character after as before their union. It is clear then that a state is not a mere society, having a common place, established for the prevention of mutual crime and for the sake of exchange. These are conditions without which a state cannot exist; but all of them together do not constitute a state, which is a community of families and aggregations of families in well-being, for the sake of a perfect and self-sufficing life. Such a community can only be

established among those who live in the same place and intermarry. Hence arise in cities family connections, brotherhoods, common sacrifices, amusements which draw men together. But these are created by friendship, for the will to live together is friendship. The end of the state is the good life, and these are the means towards it. And the state is the union of families and villages in a perfect and self-sufficing life, by which we mean a happy and honorable life.

Our conclusion, then, is that political society exists for the sake of noble actions, and not of mere companionship. Hence they who contribute most to such a society have a greater share in it than those who have the same or a greater freedom or nobility of birth but are inferior to them in political virtue; or than those who exceed them in wealth but are surpassed by them in virtue.

From what has been said it will be clearly seen that all the partisans of different forms of government speak of a part of justice only.

10

There is also a doubt as to what is to be the supreme power in the state: Is it the multitude? Or the wealthy? Or the good? Or the one best man? Or a tyrant? Any of these alternatives seems to involve disagreeable consequences. If the poor, for example, because they are more in number, divide among themselves the property of the rich – is not this unjust? No, by heaven (will be the reply), for the supreme authority justly willed it. But if this is not injustice, pray what is? Again, when in the first division all has been taken, and the majority divide anew the property of the minority, is it not evident, if this goes on, that they will ruin

the state? Yet surely, virtue is not the ruin of those who possess her, nor is justice destructive of a state; and therefore this law of confiscation clearly cannot be just. If it were, all the acts of a tyrant must of necessity be just; for he only coerces other men by superior power, just as the multitude coerce the rich. But is it just then that the few and the wealthy should be the rulers? And what if they, in like manner, rob and plunder the people – is this just? if so, the other case will likewise be just. But there can be no doubt that all these things are wrong and unjust.

Then ought the good to rule and have supreme power? But in that case everybody else, being excluded from power, will be dishonored. For the offices of a state are posts of honor; and if one set of men always holds them, the rest must be deprived of them. Then will it be well that the one best man should rule? Nay, that is still more oligarchical, for the number of those who are dishonored is thereby increased. Some one may say that it is bad in any case for a man, subject as he is to all the accidents of human passion, to have the supreme power, rather than the law. But what if the law itself be democratical or oligarchical, how will that help us out of our difficulties? Not at all; the same consequences will follow.

11

Most of these questions may be reserved for another occasion. The principle that the multitude ought to be supreme rather than the few best is one that is maintained, and, though not free from difficulty, yet seems to contain an element of truth. For the many, of whom each individual is but an ordinary person, when they meet together may very likely be better than the few good, if regarded not individually but collectively, just as

a feast to which many contribute is better than a dinner provided out of a single purse. For each individual among the many has a share of virtue and prudence, and when they meet together, they become in a manner one man, who has many feet, and hands, and senses; that is a figure of their mind and disposition. Hence the many are better judges than a single man of music and poetry; for some understand one part, and some another, and among them they understand the whole. There is a similar combination of qualities in good men, who differ from any individual of the many, as the beautiful are said to differ from those who are not beautiful, and works of art from realities, because in them the scattered elements are combined, although, if taken separately, the eye of one person or some other feature in another person would be fairer than in the picture. Whether this principle can apply to every democracy, and to all bodies of men, is not clear. Or rather, by heaven, in some cases it is impossible of application; for the argument would equally hold about brutes; and wherein, it will be asked, do some men differ from brutes? But there may be bodies of men about whom our statement is nevertheless true. And if so, the difficulty which has been already raised, and also another which is akin to it – viz., what power should be assigned to the mass of freemen and citizens, who are not rich and have no personal merit – are both solved. There is still a danger in aflowing them to share the great offices of state, for their folly will lead them into error, and their dishonesty into crime. But there is a danger also in not letting them share, for a state in which many poor men are excluded from office will necessarily be full of enemies. The only way of escape is to assign to them some deliberative and judicial functions. For this reason Solon and certain other legislators give them the power of electing to offices, and of calling the magistrates to account, but they do not allow them to hold office singly. When they meet together their perceptions are quite good enough, and

combined with the better class they are useful to the state (just as impure food when mixed with what is pure sometimes makes the entire mass more wholesome than a small quantity of the pure would be), but each individual, left to himself, forms an imperfect judgment. On the other hand, the popular form of government involves certain difficulties. In the first place, it might be objected that he who can judge of the healing of a sick man would be one who could himself heal his disease, and make him whole – that is, in other words, the physician; and so in all professions and arts. As, then, the physician ought to be called to account by physicians, so ought men in general to be called to account by their peers. But physicians are of three kinds: there is the ordinary practitioner, and there is the physician of the higher class, and thirdly the intelligent man who has studied the art: in all arts there is such a class; and we attribute the power of judging to them quite as much as to professors of the art. Secondly, does not the same principle apply to elections? For a right election can only be made by those who have knowledge; those who know geometry, for example, will choose a geometrician rightly, and those who know how to steer, a pilot; and, even if there be some occupations and arts in which private persons share in the ability to choose, they certainly cannot choose better than those who know. So that, according to this argument, neither the election of magistrates, nor the calling of them to account, should be entrusted to the many. Yet possibly these objections are to a great extent met by our old answer, that if the people are not utterly degraded, although individually they may be worse judges than those who have special knowledge – as a body they are as good or better. Moreover, there are some arts whose products are not judged of solely, or best, by the artists themselves, namely those arts whose products are recognized even by those who do not possess the art; for example, the knowledge of the house is not limited to the builder only; the

user, or, in other words, the master, of the house will be even a better judge than the builder, just as the pilot will judge better of a rudder than the carpenter, and the guest will judge better of a feast than the cook.

This difficulty seems now to be sufficiently answered, but there is another akin to it. That inferior persons should have authority in greater matters than the good would appear to be a strange thing, yet the election and calling to account of the magistrates is the greatest of all. And these, as I was saying, are functions which in some states are assigned to the people, for the assembly is supreme in all such matters. Yet persons of any age, and having but a small property qualification, sit in the assembly and deliberate and judge, although for the great officers of state, such as treasurers and generals, a high qualification is required. This difficulty may be solved in the same manner as the preceding, and the present practice of democracies may be really defensible. For the power does not reside in the dicast, or senator, or ecclesiast, but in the court, and the senate, and the assembly, of which individual senators, or ecclesiasts, or dicasts, are only parts or members. And for this reason the many may claim to have a higher authority than the few; for the people, and the senate, and the courts consist of many persons, and their property collectively is greater than the property of one or of a few individuals holding great offices. But enough of this.

The discussion of the first question shows nothing so clearly as that laws, when good, should be supreme; and that the magistrate or magistrates should regulate those matters only on which the laws are unable to speak with precision owing to the difficulty of any general principle embracing all particulars. But what are good laws has not yet been clearly explained; the old difficulty remains. The goodness or badness, justice or injustice, of laws varies of necessity with the constitutions of states. This,

however, is clear, that the laws must be adapted to the constitutions. But if so, true forms of government will of necessity have just laws, and perverted forms of government will have unjust laws.

12

In all sciences and arts the end is a good, and the greatest good and in the highest degree a good in the most authoritative of all – this is the political science of which the good is justice, in other words, the common interest. All men think justice to be a sort of equality; and to a certain extent they agree in the philosophical distinctions which have been laid down by us about Ethics. For they admit that justice is a thing and has a relation to persons, and that equals ought to have equality. But there still remains a question: equality or inequality of what? Here is a difficulty which calls for political speculation. For very likely some persons will say that offices of state ought to be unequally distributed according to superior excellence, in whatever respect, of the citizen, although there is no other difference between him and the rest of the community; for that those who differ in any one respect have different rights and claims. But, surely, if this is true, the complexion or height of a man, or any other advantage, will be a reason for his obtaining a greater share of political rights. The error here lies upon the surface, and may be illustrated from the other arts and sciences. When a number of flute players are equal in their art, there is no reason why those of them who are better born should have better flutes given to them; for they will not play any better on the flute, and the superior instrument should be reserved for him who is the superior artist. If what I am saying is still obscure, it will be made clearer as we proceed. For if there were

a superior flute-player who was far inferior in birth and beauty, although either of these may be a greater good than the art of flute-playing, and may excel flute-playing in a greater ratio than he excels the others in his art, still he ought to have the best flutes given to him, unless the advantages of wealth and birth contribute to excellence in flute-playing, which they do not. Moreover, upon this principle any good may be compared with any other. For if a given height may be measured wealth and against freedom, height in general may be so measured. Thus if A excels in height more than B in virtue, even if virtue in general excels height still more, all goods will be commensurable; for if a certain amount is better than some other, it is clear that some other will be equal. But since no such comparison can be made, it is evident that there is good reason why in politics men do not ground their claim to office on every sort of inequality any more than in the arts. For if some be slow, and others swift, that is no reason why the one should have little and the others much; it is in gymnastics contests that such excellence is rewarded. Whereas the rival claims of candidates for office can only be based on the possession of elements which enter into the composition of a state. And therefore the noble, or free-born, or rich, may with good reason claim office; for holders of offices must be freemen and taxpayers: a state can be no more composed entirely of poor men than entirely of slaves. But if wealth and freedom are necessary elements, justice and valor are equally so; for without the former qualities a state cannot exist at all, without the latter not well.

13

If the existence of the state is alone to be considered, then it would seem that all, or some at least, of these claims are just; but, if we take into account a good life, then, as I have already said, education and virtue have superior claims. As, however, those who are equal in one thing ought not to have an equal share in all, nor those who are unequal in one thing to have an unequal share in all, it is certain that all forms of government which rest on either of these principles are perversions. All men have a claim in a certain sense, as I have already admitted, but all have not an absolute claim. The rich claim because they have a greater share in the land, and land is the common element of the state; also they are generally more trustworthy in contracts. The free claim under the same tide as the noble; for they are nearly akin. For the noble are citizens in a truer sense than the ignoble, and good birth is always valued in a man's own home and country. Another reason is, that those who are sprung from better ancestors are likely to be better men, for nobility is excellence of race. Virtue, too, may be truly said to have a claim, for justice has been acknowledged by us to be a social virtue, and it implies all others. Again, the many may urge their claim against the few; for, when taken collectively, and compared with the few, they are stronger and richer and better. But, what if the good, the rich, the noble, and the other classes who make up a state, are all living together in the same city, Will there, or will there not, be any doubt who shall rule? No doubt at all in determining who ought to rule in each of the above-mentioned forms of government. For states are characterized by differences in their governing bodies – one of them has a government of the rich, another of the virtuous, and so on. But a difficulty arises when all these elements co-exist. How are we to decide? Suppose the virtuous to be very few in number: may we consider their numbers in relation to their duties, and ask whether they are enough to administer the state, or so many as

will make up a state? Objections may be urged against all the aspirants to political power. For those who found their claims on wealth or family might be thought to have no basis of justice; on this principle, if any one person were richer than all the rest, it is clear that he ought to be ruler of them. In like manner he who is very distinguished by his birth ought to have the superiority over all those who claim on the ground that they are freeborn. In an aristocracy, or government of the best, a like difficulty occurs about virtue; for if one citizen be better than the other members of the government, however good they may be, he too, upon the same principle of justice, should rule over them. And if the people are to be supreme because they are stronger than the few, then if one man, or more than one, but not a majority, is stronger than the many, they ought to rule, and not the many.

All these considerations appear to show that none of the principles on which men claim to rule and to hold all other men in subjection to them are strictly right. To those who claim to be masters of the government on the ground of their virtue or their wealth, the many might fairly answer that they themselves are often better and richer than the few – I do not say individually, but collectively. And another ingenious objection which is sometimes put forward may be met in a similar manner. Some persons doubt whether the legislator who desires to make the justest laws ought to legislate with a view to the good of the higher classes or of the many, when the case which we have mentioned occurs. Now what is just or right is to be interpreted in the sense of 'what is equal'; and that which is right in the sense of being equal is to be considered with reference to the advantage of the state, and the common good of the citizens. And a citizen is one who shares in governing and being governed. He differs under different forms of government, but in the best state he is one who is able and willing to be governed and to govern with a view to the life of virtue.

If, however, there be some one person, or more than one, although not enough to make up the full complement of a state, whose virtue is so pre-eminent that the virtues or the political capacity of all the rest admit of no comparison with his or theirs, he or they can be no longer regarded as part of a state; for justice will not be done to the superior, if he is reckoned only as the equal of those who are so far inferior to him in virtue and in political capacity. Such an one may truly be deemed a God among men. Hence we see that legislation is necessarily concerned only with those who are equal in birth and in capacity; and that for men of pre-eminent virtue there is no law – they are themselves a law. Any would be ridiculous who attempted to make laws for them: they would probably retort what, in the fable of Antisthenes, the lions said to the hares, when in the council of the beasts the latter began haranguing and claiming equality for all. And for this reason democratic states have instituted ostracism; equality is above all things their aim, and therefore they ostracized and banished from the city for a time those who seemed to predominate too much through their wealth, or the number of their friends, or through any other political influence. Mythology tells us that the Argonauts left Heracles behind for a similar reason; the ship Argo would not take him because she feared that he would have been too much for the rest of the crew. Wherefore those who denounce tyranny and blame the counsel which Periander gave to Thrasybulus cannot be held altogether just in their censure. The story is that Periander, when the herald was sent to ask counsel of him, said nothing, but only cut off the tallest ears of corn till he had brought the field to a level. The herald did not know the meaning of the action, but came and reported what he had seen to Thrasybulus, who understood that he was to cut off the principal men in the state; and this is a policy not only expedient for tyrants or in practice confined to them, but equally necessary in oligarchies and democracies. Ostracism is

a measure of the same kind, which acts by disabling and banishing the most prominent citizens. Great powers do the same to whole cities and nations, as the Athenians did to the Samians, Chians, and Lesbians; no sooner had they obtained a firm grasp of the empire, than they humbled their allies contrary to treaty; and the Persian king has repeatedly crushed the Medes, Babylonians, and other nations, when their spirit has been stirred by the recollection of their former greatness.

The problem is a universal one, and equally concerns all forms of government, true as well as false; for, although perverted forms with a view to their own interests may adopt this policy, those which seek the common interest do so likewise. The same thing may be observed in the arts and sciences; for the painter will not allow the figure to have a foot which, however beautiful, is not in proportion, nor will the shipbuilder allow the stem or any other part of the vessel to be unduly large, any more than the chorus-master will allow any one who sings louder or better than all the rest to sing in the choir. Monarchs, too, may practice compulsion and still live in harmony with their cities, if their own government is for the interest of the state. Hence where there is an acknowledged superiority the argument in favor of ostracism is based upon a kind of political justice. It would certainly be better that the legislator should from the first so order his state as to have no need of such a remedy. But if the need arises, the next best thing is that he should endeavor to correct the evil by this or some similar measure. The principle, however, has not been fairly applied in states; for, instead of looking to the good of their own constitution, they have used ostracism for factious purposes. It is true that under perverted forms of government, and from their special point of view, such a measure is just and expedient, but it is also clear that it is not absolutely just. In the perfect state there would be great doubts about the use of it, not when applied to excess in strength, wealth, popularity, or the like, but when used against some one

who is pre-eminent in virtue – what is to be done with him? Mankind will not say that such an one is to be expelled and exiled; on the other hand, he ought not to be a subject – that would be as if mankind should claim to rule over Zeus, dividing his offices among them. The only alternative is that all should joyfully obey such a ruler, according to what seems to be the order of nature, and that men like him should be kings in their state for life.

14

The preceding discussion, by a natural transition, leads to the consideration of royalty, which we admit to be one of the true forms of government. Let us see whether in order to be well governed a state or country should be under the rule of a king or under some other form of government; and whether monarchy, although good for some, may not be bad for others. But first we must determine whether there is one species of royalty or many. It is easy to see that there are many, and that the manner of government is not the same in all of them.

Of royalties according to law, (1) the Lacedaemonian is thought to answer best to the true pattern; but there the royal power is not absolute, except when the kings go on an expedition, and then they take the command. Matters of religion are likewise committed to them. The kingly office is in truth a kind of generalship, irresponsible and perpetual. The king has not the power of life and death, except in a specified case, as for instance, in ancient times, he had it when upon a campaign, by right of force. This custom is described in Homer. For Agamemnon is patient when he is attacked in the assembly, but when the army goes out to battle he has the power even of life

and death. Does he not say – 'When I find a man skulking apart from the battle, nothing shall save him from the dogs and vultures, for in my hands is death'?

This, then, is one form of royalty – a generalship for life: and of such royalties some are hereditary and others elective.

(2) There is another sort of monarchy not uncommon among the barbarians, which nearly resembles tyranny. But this is both legal and hereditary. For barbarians, being more servile in character than Hellenes, and Asiadics than Europeans, do not rebel against a despotic government. Such royalties have the nature of tyrannies because the people are by nature slaves; but there is no danger of their being overthrown, for they are hereditary and legal. Wherefore also their guards are such as a king and not such as a tyrant would employ, that is to say, they are composed of citizens, whereas the guards of tyrants are mercenaries. For kings rule according to law over voluntary subjects, but tyrants over involuntary; and the one are guarded by their fellow-citizens the others are guarded against them.

These are two forms of monarchy, and there was a third (3) which existed in ancient Hellas, called an Aesymnetia or dictatorship. This may be defined generally as an elective tyranny, which, like the barbarian monarchy, is legal, but differs from it in not being hereditary. Sometimes the office was held for life, sometimes for a term of years, or until certain duties had been performed. For example, the Mytilenaeans elected Pittacus leader against the exiles, who were headed by Antimenides and Alcaeus the poet. And Alcaeus himself shows in one of his banquet odes that they chose Pittacus tyrant, for he reproaches his fellow-citizens for 'having made the low-born Pittacus tyrant of the spiritless and ill-fated city, with one voice shouting his praises.'

These forms of government have always had the character of tyrannies, because they possess despotic power; but inasmuch as they are elective and acquiesced in by their subjects, they are kingly.

(4) There is a fourth species of kingly rule – that of the heroic times – which was hereditary and legal, and was exercised over willing subjects. For the first chiefs were benefactors of the people in arts or arms; they either gathered them into a community, or procured land for them; and thus they became kings of voluntary subjects, and their power was inherited by their descendants. They took the command in war and presided over the sacrifices, except those which required a priest. They also decided causes either with or without an oath; and when they swore, the form of the oath was the stretching out of their sceptre. In ancient times their power extended continuously to all things whatsoever, in city and country, as well as in foreign parts; but at a later date they relinquished several of these privileges, and others the people took from them, until in some states nothing was left to them but the sacrifices; and where they retained more of the reality they had only the right of leadership in war beyond the border.

These, then, are the four kinds of royalty. First the monarchy of the heroic ages; this was exercised over voluntary subjects, but limited to certain functions; the king was a general and a judge, and had the control of religion The second is that of the barbarians, which is a hereditary despotic government in accordance with law. A third is the power of the so-called Aesynmete or Dictator; this is an elective tyranny. The fourth is the Lacedaemonian, which is in fact a generalship, hereditary and perpetual. These four forms differ from one another in the manner which I have described.

(5) There is a fifth form of kingly rule in which one has the disposal of all, just as each nation or each state has the disposal of public matters; this form corresponds to the control of a household. For as household management is the kingly rule of a house, so kingly rule is the household management of a city, or of a nation, or of many nations.

15

Of these forms we need only consider two, the Lacedaemonian and the absolute royalty; for most of the others he in a region between them, having less power than the last, and more than the first. Thus the inquiry is reduced to two points: first, is it advantageous to the state that there should be a perpetual general, and if so, should the office be confined to one family, or open to the citizens in turn? Secondly, is it well that a single man should have the supreme power in all things? The first question falls under the head of laws rather than of constitutions; for perpetual generalship might equally exist under any form of government, so that this matter may be dismissed for the present. The other kind of royalty is a sort of constitution; this we have now to consider, and briefly to run over the difficulties involved in it. We will begin by inquiring whether it is more advantageous to be ruled by the best man or by the best laws.

The advocates of royalty maintain that the laws speak only in general terms, and cannot provide for circumstances; and that for any science to abide by written rules is absurd. In Egypt the physician is allowed to alter his treatment after the fourth day, but if sooner, he takes the risk. Hence it is clear that a government acting according to written laws is plainly not the

best. Yet surely the ruler cannot dispense with the general principle which exists in law; and this is a better ruler which is free from passion than that in which it is innate. Whereas the law is passionless, passion must ever sway the heart of man. Yes, it may be replied, but then on the other hand an individual will be better able to deliberate in particular cases.

The best man, then, must legislate, and laws must be passed, but these laws will have no authority when they miss the mark, though in all other cases retaining their authority. But when the law cannot determine a point at all, or not well, should the one best man or should all decide? According to our present practice assemblies meet, sit in judgment, deliberate, and decide, and their judgments an relate to individual cases. Now any member of the assembly, taken separately, is certainly inferior to the wise man. But the state is made up of many individuals. And as a feast to which all the guests contribute is better than a banquet furnished by a single man, so a multitude is a better judge of many things than any individual.

Again, the many are more incorruptible than the few; they are like the greater quantity of water which is less easily corrupted than a little. The individual is liable to be overcome by anger or by some other passion, and then his judgment is necessarily perverted; but it is hardly to be supposed that a great number of persons would all get into a passion and go wrong at the same moment. Let us assume that they are the freemen, and that they never act in violation of the law, but fill up the gaps which the law is obliged to leave. Or, if such virtue is scarcely attainable by the multitude, we need only suppose that the majority are good men and good citizens, and ask which will be the more incorruptible, the one good ruler, or the many who are all good? Will not the many? But, you will say, there may be parties among them, whereas the one man is not divided against himself. To which we may answer that their character is

as good as his. If we call the rule of many men, who are all of them good, aristocracy, and the rule of one man royalty, then aristocracy will be better for states than royalty, whether the government is supported by force or not, provided only that a number of men equal in virtue can be found.

The first governments were kingships, probably for this reason, because of old, when cities were small, men of eminent virtue were few. Further, they were made kings because they were benefactors, and benefits can only be bestowed by good men. But when many persons equal in merit arose, no longer enduring the pre-eminence of one, they desired to have a commonwealth, and set up a constitution. The ruling class soon deteriorated and enriched themselves out of the public treasury; riches became the path to honor, and so oligarchies naturally grew up. These passed into tyrannies and tyrannies into democracies; for love of gain in the ruling classes was always tending to diminish their number, and so to strengthen the masses, who in the end set upon their masters and established democracies. Since cities have increased in size, no other form of government appears to be any longer even easy to establish.

Even supposing the principle to be maintained that kingly power is the best thing for states, how about the family of the king? Are his children to succeed him? If they are no better than anybody else, that will be mischievous. But, says the lover of royalty, the king, though he might, will not hand on his power to his children. That, however, is hardly to be expected, and is too much to ask of human nature. There is also a difficulty about the force which he is to employ; should a king have guards about him by whose aid he may be able to coerce the refractory? If not, how will he administer his kingdom? Even if he be the lawful sovereign who does nothing arbitrarily or contrary to law, still he must have some force wherewith to maintain the law. In the case of a limited monarchy there is not much difficulty in

answering this question; the king must have such force as will be more than a match for one or more individuals, but not so great as that of the people. The ancients observe this principle when they have guards to any one whom they appointed dictator or tyrant. Thus, when Dionysius asked the Syracusans to allow him guards, somebody advised that they should give him only such a number.

16

At this place in the discussion there impends the inquiry respecting the king who acts solely according to his own will he has now to be considered. The so-called limited monarchy, or kingship according to law, as I have already remarked, is not a distinct form of government, for under all governments, as, for example, in a democracy or aristocracy, there may be a general holding office for life, and one person is often made supreme over the administration of a state. A magistracy of this kind exists at Epidamnus, and also at Opus, but in the latter city has a more limited power. Now, absolute monarchy, or the arbitrary rule of a sovereign over an the citizens, in a city which consists of equals, is thought by some to be quite contrary to nature; it is argued that those who are by nature equals must have the same natural right and worth, and that for unequals to have an equal share, or for equals to have an uneven share, in the offices of state, is as bad as for different bodily constitutions to have the same food and clothing. Wherefore it is thought to be just that among equals every one be ruled as well as rule, and therefore that an should have their turn. We thus arrive at law; for an order of succession implies law. And the rule of the law, it is argued, is preferable to that of any individual. On the same principle, even if it be better for certain individuals to govern,

they should be made only guardians and ministers of the law. For magistrates there must be – this is admitted; but then men say that to give authority to any one man when all are equal is unjust. Nay, there may indeed be cases which the law seems unable to determine, but in such cases can a man? Nay, it will be replied, the law trains officers for this express purpose, and appoints them to determine matters which are left undecided by it, to the best of their judgment. Further, it permits them to make any amendment of the existing laws which experience suggests. Therefore he who bids the law rule may be deemed to bid God and Reason alone rule, but he who bids man rule adds an element of the beast; for desire is a wild beast, and passion perverts the minds of rulers, even when they are the best of men. The law is reason unaffected by desire. We are told that a patient should call in a physician; he will not get better if he is doctored out of a book. But the parallel of the arts is clearly not in point; for the physician does nothing contrary to rule from motives of friendship; he only cures a patient and takes a fee; whereas magistrates do many things from spite and partiality. And, indeed, if a man suspected the physician of being in league with his enemies to destroy him for a bribe, he would rather have recourse to the book. But certainly physicians, when they are sick, call in other physicians, and training-masters, when they are in training, other training-masters, as if they could not judge judge truly about their own case and might be influenced by their feelings. Hence it is evident that in seeking for justice men seek for the mean or neutral, for the law is the mean. Again, customary laws have more weight, and relate to more important matters, than written laws, and a man may be a safer ruler than the written law, but not safer than the customary law.

Again, it is by no means easy for one man to superintend many things; he will have to appoint a number of subordinates, and what difference does it make whether these subordinates always existed or were appointed by him because he needed

theme If, as I said before, the good man has a right to rule because he is better, still two good men are better than one: this is the old saying, two going together, and the prayer of Agamemnon,

Would that I had ten such councillors!

And at this day there are magistrates, for example judges, who have authority to decide some matters which the law is unable to determine, since no one doubts that the law would command and decide in the best manner whatever it could. But some things can, and other things cannot, be comprehended under the law, and this is the origin of the nexted question whether the best law or the best man should rule. For matters of detail about which men deliberate cannot be included in legislation. Nor does any one deny that the decision of such matters must be left to man, but it is argued that there should be many judges, and not one only. For every ruler who has been trained by the law judges well; and it would surely seem strange that a person should see better with two eyes, or hear better with two ears, or act better with two hands or feet, than many with many; indeed, it is already the practice of kings to make to themselves many eyes and ears and hands and feet. For they make colleagues of those who are the friends of themselves and their governments. They must be friends of the monarch and of his government; if not his friends, they will not do what he wants; but friendship implies likeness and equality; and, therefore, if he thinks that his friends ought to rule, he must think that those who are equal to himself and like himself ought to rule equally with himself. These are the principal controversies relating to monarchy.

17

But may not all this be true in some cases and not in others? for there is by nature both a justice and an advantage appropriate to the rule of a master, another to kingly rule, another to constitutional rule; but there is none naturally appropriate to tyranny, or to any other perverted form of government; for these come into being contrary to nature. Now, to judge at least from what has been said, it is manifest that, where men are alike and equal, it is neither expedient nor just that one man should be lord of all, whether there are laws, or whether there are no laws, but he himself is in the place of law. Neither should a good man be lord over good men, nor a bad man over bad; nor, even if he excels in virtue, should he have a right to rule, unless in a particular case, at which I have already hinted, and to which I will once more recur. But first of all, I must determine what natures are suited for government by a king, and what for an aristocracy, and what for a constitutional government.

A people who are by nature capable of producing a race superior in the virtue needed for political rule are fitted for kingly government; and a people submitting to be ruled as freemen by men whose virtue renders them capable of political command are adapted for an aristocracy; while the people who are suited for constitutional freedom are those among whom there naturally exists a warlike multitude able to rule and to obey in turn by a law which gives office to the well-to-do according to their desert. But when a whole family or some individual, happens to be so pre-eminent in virtue as to surpass all others, then it is just that they should be the royal family and supreme over all, or that this one citizen should be king of the whole nation. For, as I said before, to give them authority is not only agreeable to that ground of right which the founders of all states, whether aristocratical, or oligarchical, or again democratical, are accustomed to put forward (for these all

recognize the claim of excellence, although not the same excellence), but accords with the principle already laid down. For surely it would not be right to kill, or ostracize, or exile such a person, or require that he should take his turn in being governed. The whole is naturally superior to the part, and he who has this pre-eminence is in the relation of a whole to a part. But if so, the only alternative is that he should have the supreme power, and that mankind should obey him, not in turn, but always. These are the conclusions at which we arrive respecting royalty and its various forms, and this is the answer to the question, whether it is or is not advantageous to states, and to which, and how.

18

We maintain that the true forms of government are three, and that the best must be that which is administered by the best, and in which there is one man, or a whole family, or many persons, excelling all the others together in virtue, and both rulers and subjects are fitted, the one to rule, the others to be ruled, in such a manner as to attain the most eligible life. We showed at the commencement of our inquiry that the virtue of the good man is necessarily the same as the virtue of the citizen of the perfect state. Clearly then in the same manner, and by the same means through which a man becomes truly good, he will frame a state that is to be ruled by an aristocracy or by a king, and the same education and the same habits will be found to make a good man and a man fit to be a statesman or a king.

Having arrived at these conclusions, we must proceed to speak of the perfect state, and describe how it comes into being and is established.

Book IV

1

In all arts and sciences which embrace the whole of any subject, and do not come into being in a fragmentary way, it is the province of a single art or science to consider all that appertains to a single subject. For example, the art of gymnastic considers not only the suitableness of different modes of training to different bodies (2), but what sort is absolutely the best (1); (for the absolutely best must suit that which is by nature best and best furnished with the means of life), and also what common form of training is adapted to the great majority of men (4). And if a man does not desire the best habit of body, or the greatest skill in gymnastics, which might be attained by him, still the trainer or the teacher of gymnastic should be able to impart any lower degree of either (3). The same principle equally holds in medicine and shipbuilding, and the making of clothes, and in the arts generally.

Hence it is obvious that government too is the subject of a single science, which has to consider what government is best and of what sort it must be, to be most in accordance with our aspirations, if there were no external impediment, and also what kind of government is adapted to particular states. For the best is often unattainable, and therefore the true legislator and statesman ought to be acquainted, not only with (1) that which

is best in the abstract, but also with (2) that which is best relatively to circumstances. We should be able further to say how a state may be constituted under any given conditions (3); both how it is originally formed and, when formed, how it may be longest preserved; the supposed state being so far from having the best constitution that it is unprovided even with the conditions necessary for the best; neither is it the best under the circumstances, but of an inferior type.

He ought, moreover, to know (4) the form of government which is best suited to states in general; for political writers, although they have excellent ideas, are often unpractical. We should consider, not only what form of government is best, but also what is possible and what is easily attainable by all. There are some who would have none but the most perfect; for this many natural advantages are required. Others, again, speak of a more attainable form, and, although they reject the constitution under which they are living, they extol some one in particular, for example the Lacedaemonian. Any change of government which has to be introduced should be one which men, starting from their existing constitutions, will be both willing and able to adopt, since there is quite as much trouble in the reformation of an old constitution as in the establishment of a new one, just as to unlearn is as hard as to learn. And therefore, in addition to the qualifications of the statesman already mentioned, he should be able to find remedies for the defects of existing constitutions, as has been said before. This he cannot do unless he knows how many forms of government there are. It is often supposed that there is only one kind of democracy and one of oligarchy. But this is a mistake; and, in order to avoid such mistakes, we must ascertain what differences there are in the constitutions of states, and in how many ways they are combined. The same political insight will enable a man to know which laws are the best, and which are suited to different constitutions; for the laws are, and ought to be, relative to the

constitution, and not the constitution to the laws. A constitution is the organization of offices in a state, and determines what is to be the governing body, and what is the end of each community. But laws are not to be confounded with the principles of the constitution; they are the rules according to which the magistrates should administer the state, and proceed against offenders. So that we must know the varieties, and the number of varieties, of each form of government, if only with a view to making laws. For the same laws cannot be equally suited to all oligarchies or to all democracies, since there is certainly more than one form both of democracy and of oligarchy.

2

In our original discussion about governments we divided them into three true forms: kingly rule, aristocracy, and constitutional government, and three corresponding perversions – tyranny, oligarchy, and democracy. Of kingly rule and of aristocracy, we have already spoken, for the inquiry into the perfect state is the same thing with the discussion of the two forms thus named, since both imply a principle of virtue provided with external means. We have already determined in what aristocracy and kingly rule differ from one another, and when the latter should be established. In what follows we have to describe the so-called constitutional government, which bears the common name of all constitutions, and the other forms, tyranny, oligarchy, and democracy.

It is obvious which of the three perversions is the worst, and which is the next in badness. That which is the perversion of the first and most divine is necessarily the worst. And just as a

royal rule, if not a mere name, must exist by virtue of some great personal superiority in the king, so tyranny, which is the worst of governments, is necessarily the farthest removed from a well-constituted form; oligarchy is little better, for it is a long way from aristocracy, and democracy is the most tolerable of the three.

A writer who preceded me has already made these distinctions, but his point of view is not the same as mine. For he lays down the principle that when all the constitutions are good (the oligarchy and the rest being virtuous), democracy is the worst, but the best when all are bad. Whereas we maintain that they are in any case defective, and that one oligarchy is not to be accounted better than another, but only less bad.

Not to pursue this question further at present, let us begin by determining (1) how many varieties of constitution there are (since of democracy and oligarchy there are several): (2) what constitution is the most generally acceptable, and what is eligible in the next degree after the perfect state; and besides this what other there is which is aristocratical and well-constituted, and at the same time adapted to states in general; (3) of the other forms of government to whom each is suited. For democracy may meet the needs of some better than oligarchy, and conversely. In the next place (4) we have to consider in what manner a man ought to proceed who desires to establish some one among these various forms, whether of democracy or of oligarchy; and lastly, (5) having briefly discussed these subjects to the best of our power, we will endeavor to ascertain the modes of ruin and preservation both of constitutions generally and of each separately, and to what causes they are to be attributed.

3

The reason why there are many forms of government is that every state contains many elements. In the first place we see that all states are made up of families, and in the multitude of citizen there must be some rich and some poor, and some in a middle condition; the rich are heavy-armed, and the poor not. Of the common people, some are husbandmen, and some traders, and some artisans. There are also among the notables differences of wealth and property – for example, in the number of horses which they keep, for they cannot afford to keep them unless they are rich. And therefore in old times the cities whose strength lay in their cavalry were oligarchies, and they used cavalry in wars against their neighbors; as was the practice of the Eretrians and Chalcidians, and also of the Magnesians on the river Maeander, and of other peoples in Asia. Besides differences of wealth there are differences of rank and merit, and there are some other elements which were mentioned by us when in treating of aristocracy we enumerated the essentials of a state. Of these elements, sometimes all, sometimes the lesser and sometimes the greater number, have a share in the government. It is evident then that there must be many forms of government, differing in kind, since the parts of which they are composed differ from each other in kind. For a constitution is an organization of offices, which all the citizens distribute among themselves, according to the power which different classes possess, for example the rich or the poor, or according to some principle of equality which includes both. There must therefore be as many forms of government as there are modes of arranging the offices, according to the superiorities and differences of the parts of the state.

There are generally thought to be two principal forms: as men say of the winds that there are but two – north and south, and that the rest of them are only variations of these, so of

governments there are said to be only two forms – democracy and oligarchy. For aristocracy is considered to be a kind of oligarchy, as being the rule of a few, and the so-called constitutional government to be really a democracy, just as among the winds we make the west a variation of the north, and the east of the south wind. Similarly of musical modes there are said to be two kinds, the Dorian and the Phrygian; the other arrangements of the scale are comprehended under one or other of these two. About forms of government this is a very favorite notion. But in either case the better and more exact way is to distinguish, as I have done, the one or two which are true forms, and to regard the others as perversions, whether of the most perfectly attempered mode or of the best form of government: we may compare the severer and more overpowering modes to the oligarchical forms, and the more relaxed and gentler ones to the democratic.

4

It must not be assumed, as some are fond of saying, that democracy is simply that form of government in which the greater number are sovereign, for in oligarchies, and indeed in every government, the majority rules; nor again is oligarchy that form of government in which a few are sovereign. Suppose the whole population of a city to be 1300, and that of these 1000 are rich, and do not allow the remaining 300 who are poor, but free, and in an other respects their equals, a share of the government – no one will say that this is a democracy. In like manner, if the poor were few and the masters of the rich who outnumber them, no one would ever call such a government, in which the rich majority have no share of office, an oligarchy. Therefore we should rather say that democracy is the form of government in

which the free are rulers, and oligarchy in which the rich; it is only an accident that the free are the many and the rich are the few. Otherwise a government in which the offices were given according to stature, as is said to be the case in Ethiopia, or according to beauty, would be an oligarchy; for the number of tall or good-looking men is small. And yet oligarchy and democracy are not sufficiently distinguished merely by these two characteristics of wealth and freedom. Both of them contain many other elements, and therefore we must carry our analysis further, and say that the government is not a democracy in which the freemen, being few in number, rule over the many who are not free, as at Apollonia, on the Ionian Gulf, and at Thera; (for in each of these states the nobles, who were also the earliest settlers, were held in chief honor, although they were but a few out of many). Neither is it a democracy when the rich have the government because they exceed in number; as was the case formerly at Colophon, where the bulk of the inhabitants were possessed of large property before the Lydian War. But the form of government is a democracy when the free, who are also poor and the majority, govern, and an oligarchy when the rich and the noble govern, they being at the same time few in number.

I have said that there are many forms of government, and have explained to what causes the variety is due. Why there are more than those already mentioned, and what they are, and whence they arise, I will now proceed to consider, starting from the principle already admitted, which is that every state consists, not of one, but of many parts. If we were going to speak of the different species of animals, we should first of all determine the organs which are indispensable to every animal, as for example some organs of sense and the instruments of receiving and digesting food, such as the mouth and the stomach, besides organs of locomotion. Assuming now that there are only so many kinds of organs, but that there may be differences in

them – I mean different kinds of mouths, and stomachs, and perceptive and locomotive organs – the possible combinations of these differences will necessarily furnish many variedes of animals. (For animals cannot be the same which have different kinds of mouths or of ears.) And when all the combinations are exhausted, there will be as many sorts of animals as there are combinations of the necessary organs. The same, then, is true of the forms of government which have been described; states, as I have repeatedly said, are composed, not of one, but of many elements. One element is the food-producing class, who are called husbandmen; a second, the class of mechanics who practice the arts without which a city cannot exist; of these arts some are absolutely necessary, others contribute to luxury or to the grace of life. The third class is that of traders, and by traders I mean those who are engaged in buying and selling, whether in commerce or in retail trade. A fourth class is that of the serfs or laborers. The warriors make up the fifth class, and they are as necessary as any of the others, if the country is not to be the slave of every invader. For how can a state which has any title to the name be of a slavish nature? The state is independent and self-sufficing, but a slave is the reverse of independent. Hence we see that this subject, though ingeniously, has not been satisfactorily treated in the Republic. Socrates says that a state is made up of four sorts of people who are absolutely necessary; these are a weaver, a husbandman, a shoemaker, and a builder; afterwards, finding that they are not enough, he adds a smith, and again a herdsman, to look after the necessary animals; then a merchant, and then a retail trader. All these together form the complement of the first state, as if a state were established merely to supply the necessaries of life, rather than for the sake of the good, or stood equally in need of shoemakers and of husbandmen. But he does not admit into the state a military class until the country has increased in size, and is beginning to encroach on its neighbor's land, whereupon they go to war. Yet

even amongst his four original citizens, or whatever be the number of those whom he associates in the state, there must be some one who will dispense justice and determine what is just. And as the soul may be said to be more truly part of an animal than the body, so the higher parts of states, that is to say, the warrior class, the class engaged in the administration of justice, and that engaged in deliberation, which is the special business of political common sense – these are more essential to the state than the parts which minister to the necessaries of life. Whether their several functions are the functions of different citizens, or of the same – for it may often happen that the same persons are both warriors and husbandmen – is immaterial to the argument. The higher as well as the lower elements are to be equally considered parts of the state, and if so, the military element at any rate must be included. There are also the wealthy who minister to the state with their property; these form the seventh class. The eighth class is that of magistrates and of officers; for the state cannot exist without rulers. And therefore some must be able to take office and to serve the state, either always or in turn. There only remains the class of those who deliberate and who judge between disputants; we were just now distinguishing them. If presence of all these elements, and their fair and equitable organization, is necessary to states, then there must also be persons who have the ability of statesmen. Different functions appear to be often combined in the same individual; for example, the warrior may also be a husbandman, or an artisan; or, again, the councillor a judge. And all claim to possess political ability, and think that they are quite competent to fill most offices. But the same persons cannot be rich and poor at the same time. For this reason the rich and the poor are regarded in an especial sense as parts of a state. Again, because the rich are generally few in number, while the poor are many, they appear to be antagonistic, and as the one or the other prevails they form the government. Hence

arises the common opinion that there are two kinds of government – democracy and oligarchy.

I have already explained that there are many forms of constitution, and to what causes the variety is due. Let me now show that there are different forms both of democracy and oligarchy, as will indeed be evident from what has preceded. For both in the common people and in the notables various classes are included; of the common people, one class are husbandmen, another artisans; another traders, who are employed in buying and selling; another are the seafaring class, whether engaged in war or in trade, as ferrymen or as fishermen. (In many places any one of these classes forms quite a large population; for example, fishermen at Tarentum and Byzantium, crews of triremes at Athens, merchant seamen at Aegina and Chios, ferrymen at Tenedos.) To the classes already mentioned may be added day-laborers, and those who, owing to their needy circumstances, have no leisure, or those who are not of free birth on both sides; and there may be other classes as well. The notables again may be divided according to their wealth, birth, virtue, education, and similar differences.

Of forms of democracy first comes that which is said to be based strictly on equality. In such a democracy the law says that it is just for the poor to have no more advantage than the rich; and that neither should be masters, but both equal. For if liberty and equality, as is thought by some, are chiefly to be found in democracy, they will be best attained when all persons alike share in the government to the utmost. And since the people are the majority, and the opinion of the majority is decisive, such a government must necessarily be a democracy. Here then is one sort of democracy. There is another, in which the magistrates are elected according to a certain property qualification, but a low one; he who has the required amount of property has a share in the government, but he who loses his

property loses his rights. Another kind is that in which all the citizens who are under no disqualification share in the government, but still the law is supreme. In another, everybody, if he be only a citizen, is admitted to the government, but the law is supreme as before. A fifth form of democracy, in other respects the same, is that in which, not the law, but the multitude, have the supreme power, and supersede the law by their decrees. This is a state of affairs brought about by the demagogues. For in democracies which are subject to the law the best citizens hold the first place, and there are no demagogues; but where the laws are not supreme, there demagogues spring up. For the people becomes a monarch, and is many in one; and the many have the power in their hands, not as individuals, but collectively. Homer says that 'it is not good to have a rule of many,' but whether he means this corporate rule, or the rule of many individuals, is uncertain. At all events this sort of democracy, which is now a monarch, and no longer under the control of law, seeks to exercise monarchical sway, and grows into a despot; the flatterer is held in honor; this sort of democracy being relatively to other democracies what tyranny is to other forms of monarchy. The spirit of both is the same, and they alike exercise a despotic rule over the better citizens. The decrees of the demos correspond to the edicts of the tyrant; and the demagogue is to the one what the flatterer is to the other. Both have great power; the flatterer with the tyrant, the demagogue with democracies of the kind which we are describing. The demagogues make the decrees of the people override the laws, by referring all things to the popular assembly. And therefore they grow great, because the people have an things in their hands, and they hold in their hands the votes of the people, who are too ready to listen to them. Further, those who have any complaint to bring against the magistrates say, 'Let the people be judges'; the people are too happy to accept the invitation; and so the authority of every

office is undermined. Such a democracy is fairly open to the objection that it is not a constitution at all; for where the laws have no authority, there is no constitution. The law ought to be supreme over all, and the magistracies should judge of particulars, and only this should be considered a constitution. So that if democracy be a real form of government, the sort of system in which all things are regulated by decrees is clearly not even a democracy in the true sense of the word, for decrees relate only to particulars.

These then are the different kinds of democracy.

5

Of oligarchies, too, there are different kinds: one where the property qualification for office is such that the poor, although they form the majority, have no share in the government, yet he who acquires a qualification may obtain a share. Another sort is when there is a qualification for office, but a high one, and the vacancies in the governing body are fired by co-optation. If the election is made out of all the qualified persons, a constitution of this kind inclines to an aristocracy, if out of a privileged class, to an oligarchy. Another sort of oligarchy is when the son succeeds the father. There is a fourth form, likewise hereditary, in which the magistrates are supreme and not the law. Among oligarchies this is what tyranny is among monarchies, and the last-mentioned form of democracy among democracies; and in fact this sort of oligarchy receives the name of a dynasty (or rule of powerful families).

These are the different sorts of oligarchies and democracies. It should, however, be remembered that in many states the constitution which is established by law, although not

democratic, owing to the education and habits of the people may be administered democratically, and conversely in other states the established constitution may incline to democracy, but may be administered in an oligarchical spirit. This most often happens after a revolution: for governments do not change at once; at first the dominant party are content with encroaching a little upon their opponents. The laws which existed previously continue in force, but the authors of the revolution have the power in their hands.

6

From what has been already said we may safely infer that there are so many different kinds of democracies and of oligarchies. For it is evident that either all the classes whom we mentioned must share in the government, or some only and not others. When the class of husbandmen and of those who possess moderate fortunes have the supreme power, the government is administered according to law. For the citizens being compelled to live by their labor have no leisure; and so they set up the authority of the law, and attend assemblies only when necessary. They all obtain a share in the government when they have acquired the qualification which is fixed by the law – the absolute exclusion of any class would be a step towards oligarchy; hence all who have acquired the property qualification are admitted to a share in the constitution. But leisure cannot be provided for them unless there are revenues to support them. This is one sort of democracy, and these are the causes which give birth to it. Another kind is based on the distinction which naturally comes next in order; in this, every one to whose birth there is no objection is eligible, but actually shares in the government only if he can find leisure. Hence in

such a democracy the supreme power is vested in the laws, because the state has no means of paying the citizens. A third kind is when all freemen have a right to share in the government, but do not actually share, for the reason which has been already given; so that in this form again the law must rule. A fourth kind of democracy is that which comes latest in the history of states. In our own day, when cities have far outgrown their original size, and their revenues have increased, all the citizens have a place in the government, through the great preponderance of the multitude; and they all, including the poor who receive pay, and therefore have leisure to exercise their rights, share in the administration. Indeed, when they are paid, the common people have the most leisure, for they are not hindered by the care of their property, which often fetters the rich, who are thereby prevented from taking part in the assembly or in the courts, and so the state is governed by the poor, who are a majority, and not by the laws.

So many kinds of democracies there are, and they grow out of these necessary causes.

Of oligarchies, one form is that in which the majority of the citizens have some property, but not very much; and this is the first form, which allows to any one who obtains the required amount the right of sharing in the government. The sharers in the government being a numerous body, it follows that the law must govern, and not individuals. For in proportion as they are further removed from a monarchical form of government, and in respect of property have neither so much as to be able to live without attending to business, nor so little as to need state support, they must admit the rule of law and not claim to rule themselves. But if the men of property in the state are fewer than in the former case, and own more property, there arises a second form of oligarchy. For the stronger they are, the more power they claim, and having this object in view, they

themselves select those of the other classes who are to be admitted to the government; but, not being as yet strong enough to rule without the law, they make the law represent their wishes. When this power is intensified by a further diminution of their numbers and increase of their property, there arises a third and further stage of oligarchy, in which the governing class keep the offices in their own hands, and the law ordains that the son shall succeed the father. When, again, the rulers have great wealth and numerous friends, this sort of family despotism approaches a monarchy; individuals rule and not the law. This is the fourth sort of oligarchy, and is analogous to the last sort of democracy.

7

There are still two forms besides democracy and oligarchy; one of them is universally recognized and included among the four principal forms of government, which are said to be (1) monarchy, (2) oligarchy, (3) democracy, and (4) the so-called aristocracy or government of the best. But there is also a fifth, which retains the generic name of polity or constitutional government; this is not common, and therefore has not been noticed by writers who attempt to enumerate the different kinds of government; like Plato, in their books about the state, they recognize four only. The term 'aristocracy' is rightly applied to the form of government which is described in the first part of our treatise; for that only can be rightly called aristocracy which is a government formed of the best men absolutely, and not merely of men who are good when tried by any given standard. In the perfect state the good man is absolutely the same as the good citizen; whereas in other states the good citizen is only good relatively to his own form of government. But there are

some states differing from oligarchies and also differing from the so-called polity or constitutional government; these are termed aristocracies, and in them the magistrates are certainly chosen, both according to their wealth and according to their merit. Such a form of government differs from each of the two just now mentioned, and is termed an aristocracy. For indeed in states which do not make virtue the aim of the community, men of merit and reputation for virtue may be found. And so where a government has regard to wealth, virtue, and numbers, as at Carthage, that is aristocracy; and also where it has regard only to two out of the three, as at Lacedaemon, to virtue and numbers, and the two principles of democracy and virtue temper each other. There are these two forms of aristocracy in addition to the first and perfect state, and there is a third form, viz., the constitutions which incline more than the so-called polity towards oligarchy.

8

I have yet to speak of the so-called polity and of tyranny. I put them in this order, not because a polity or constitutional government is to be regarded as a perversion any more than the above mentioned aristocracies. The truth is, that they an fall short of the most perfect form of government, and so they are reckoned among perversions, and the really perverted forms are perversions of these, as I said in the original discussion. Last of all I will speak of tyranny, which I place last in the series because I am inquiring into the constitutions of states, and this is the very reverse of a constitution

Having explained why I have adopted this order, I will proceed to consider constitutional government; of which the nature will

be clearer now that oligarchy and democracy have been defined. For polity or constitutional government may be described generally as a fusion of oligarchy and democracy; but the term is usually applied to those forms of government which incline towards democracy, and the term aristocracy to those which incline towards oligarchy, because birth and education are commonly the accompaniments of wealth. Moreover, the rich already possess the external advantages the want of which is a temptation to crime, and hence they are called noblemen and gentlemen. And inasmuch as aristocracy seeks to give predominance to the best of the citizens, people say also of oligarchies that they are composed of noblemen and gentlemen. Now it appears to be an impossible thing that the state which is governed not by the best citizens but by the worst should be well-governed, and equally impossible that the state which is ill-governed should be governed by the best. But we must remember that good laws, if they are not obeyed, do not constitute good government. Hence there are two parts of good government; one is the actual obedience of citizens to the laws, the other part is the goodness of the laws which they obey; they may obey bad laws as well as good. And there may be a further subdivision; they may obey either the best laws which are attainable to them, or the best absolutely.

The distribution of offices according to merit is a special characteristic of aristocracy, for the principle of an aristocracy is virtue, as wealth is of an oligarchy, and freedom of a democracy. In all of them there of course exists the right of the majority, and whatever seems good to the majority of those who share in the government has authority. Now in most states the form called polity exists, for the fusion goes no further than the attempt to unite the freedom of the poor and the wealth of the rich, who commonly take the place of the noble. But as there are three grounds on which men claim an equal share in the government, freedom, wealth, and virtue (for the fourth or good

birth is the result of the two last, being only ancient wealth and virtue), it is clear that the admixture of the two elements, that is to say, of the rich and poor, is to be called a polity or constitutional government; and the union of the three is to be called aristocracy or the government of the best, and more than any other form of government, except the true and ideal, has a right to this name.

Thus far I have shown the existence of forms of states other than monarchy, democracy, and oligarchy, and what they are, and in what aristocracies differ from one another, and polities from aristocracies – that the two latter are not very unlike is obvious.

9

Next we have to consider how by the side of oligarchy and democracy the so-called polity or constitutional government springs up, and how it should be organized. The nature of it will be at once understood from a comparison of oligarchy and democracy; we must ascertain their different characteristics, and taking a portion from each, put the two together, like the parts of an indenture. Now there are three modes in which fusions of government may be affected. In the first mode we must combine the laws made by both governments, say concerning the administration of justice. In oligarchies they impose a fine on the rich if they do not serve as judges, and to the poor they give no pay; but in democracies they give pay to the poor and do not fine the rich. Now (1) the union of these two modes is a common or middle term between them, and is therefore characteristic of a constitutional government, for it is a combination of both. This is one mode of uniting the two

elements. Or (2) a mean may be taken between the enactments of the two: thus democracies require no property qualification, or only a small one, from members of the assembly, oligarchies a high one; here neither of these is the common term, but a mean between them. (3) There is a third mode, in which something is borrowed from the oligarchical and something from the democratical principle. For example, the appointment of magistrates by lot is thought to be democratical, and the election of them oligarchical; democratical again when there is no property qualification, oligarchical when there is. In the aristocratical or constitutional state, one element will be taken from each – from oligarchy the principle of electing to offices, from democracy the disregard of qualification. Such are the various modes of combination.

There is a true union of oligarchy and democracy when the same state may be termed either a democracy or an oligarchy; those who use both names evidently feel that the fusion is complete. Such a fusion there is also in the mean; for both extremes appear in it. The Lacedaemonian constitution, for example, is often described as a democracy, because it has many democratical features. In the first place the youth receive a democratical education. For the sons of the poor are brought up with with the sons of the rich, who are educated in such a manner as to make it possible for the sons of the poor to be educated by them. A similar equality prevails in the following period of life, and when the citizens are grown up to manhood the same rule is observed; there is no distinction between the rich and poor. In like manner they all have the same food at their public tables, and the rich wear only such clothing as any poor man can afford. Again, the people elect to one of the two greatest offices of state, and in the other they share; for they elect the Senators and share in the Ephoralty. By others the Spartan constitution is said to be an oligarchy, because it has many oligarchical elements. That all offices are filled by election

and none by lot, is one of these oligarchical characteristics; that the power of inflicting death or banishment rests with a few persons is another; and there are others. In a well attempted polity there should appear to be both elements and yet neither; also the government should rely on itself, and not on foreign aid, and on itself not through the good will of a majority – they might be equally well-disposed when there is a vicious form of government – but through the general willingness of all classes in the state to maintain the constitution.

Enough of the manner in which a constitutional government, and in which the so-called aristocracies ought to be framed.

10

Of the nature of tyranny I have still to speak, in order that it may have its place in our inquiry (since even tyranny is reckoned by us to be a form of government), although there is not much to be said about it. I have already in the former part of this treatise discussed royalty or kingship according to the most usual meaning of the term, and considered whether it is or is not advantageous to states, and what kind of royalty should be established, and from what source, and how.

When speaking of royalty we also spoke of two forms of tyranny, which are both according to law, and therefore easily pass into royalty. Among barbarians there are elected monarchs who exercise a despotic power; despotic rulers were also elected in ancient Hellas, called Aesymnetes or Dictators. These monarchies, when compared with one another, exhibit certain differences. And they are, as I said before, royal, in so far as the monarch rules according to law over willing subjects; but they are tyrannical in so far as he is despotic and rules according to

his own fancy. There is also a third kind of tyranny, which is the most typical form, and is the counterpart of the perfect monarchy. This tyranny is just that arbitrary power of an individual which is responsible to no one, and governs all alike, whether equals or better, with a view to its own advantage, not to that of its subjects, and therefore against their will. No freeman, if he can escape from it, will endure such a government.

The kinds of tyranny are such and so many, and for the reasons which I have given.

11

We have now to inquire what is the best constitution for most states, and the best life for most men, neither assuming a standard of virtue which is above ordinary persons, nor an education which is exceptionally favored by nature and circumstances, nor yet an ideal state which is an aspiration only, but having regard to the life in which the majority are able to share, and to the form of government which states in general can attain. As to those aristocracies, as they are called, of which we were just now speaking, they either lie beyond the possibilities of the greater number of states, or they approximate to the so-called constitutional government, and therefore need no separate discussion. And in fact the conclusion at which we arrive respecting all these forms rests upon the same grounds. For if what was said in the Ethics is true, that the happy life is the life according to virtue lived without impediment, and that virtue is a mean, then the life which is in a mean, and in a mean attainable by every one, must be the best. And the same the same principles of virtue and vice

are characteristic of cities and of constitutions; for the constitution is in a figure the life of the city.

Now in all states there are three elements: one class is very rich, another very poor, and a third in a mean. It is admitted that moderation and the mean are best, and therefore it will clearly be best to possess the gifts of fortune in moderation; for in that condition of life men are most ready to follow rational principle. But he who greatly excels in beauty, strength, birth, or wealth, or on the other hand who is very poor, or very weak, or very much disgraced, finds it difficult to follow rational principle. Of these two the one sort grow into violent and great criminals, the others into rogues and petty rascals. And two sorts of offenses correspond to them, the one committed from violence, the other from roguery. Again, the middle class is least likely to shrink from rule, or to be over-ambitious for it; both of which are injuries to the state. Again, those who have too much of the goods of fortune, strength, wealth, friends, and the like, are neither willing nor able to submit to authority. The evil begins at home; for when they are boys, by reason of the luxury in which they are brought up, they never learn, even at school, the habit of obedience. On the other hand, the very poor, who are in the opposite extreme, are too degraded. So that the one class cannot obey, and can only rule despotically; the other knows not how to command and must be ruled like slaves. Thus arises a city, not of freemen, but of masters and slaves, the one despising, the other envying; and nothing can be more fatal to friendship and good fellowship in states than this: for good fellowship springs from friendship; when men are at enmity with one another, they would rather not even share the same path. But a city ought to be composed, as far as possible, of equals and similars; and these are generally the middle classes. Wherefore the city which is composed of middle-class citizens is necessarily best constituted in respect of the elements of which we say the fabric of the state naturally consists. And this

is the class of citizens which is most secure in a state, for they do not, like the poor, covet their neighbors' goods; nor do others covet theirs, as the poor covet the goods of the rich; and as they neither plot against others, nor are themselves plotted against, they pass through life safely. Wisely then did Phocylides pray – 'Many things are best in the mean; I desire to be of a middle condition in my city.'

Thus it is manifest that the best political community is formed by citizens of the middle class, and that those states are likely to be well-administered in which the middle class is large, and stronger if possible than both the other classes, or at any rate than either singly; for the addition of the middle class turns the scale, and prevents either of the extremes from being dominant. Great then is the good fortune of a state in which the citizens have a moderate and sufficient property; for where some possess much, and the others nothing, there may arise an extreme democracy, or a pure oligarchy; or a tyranny may grow out of either extreme – either out of the most rampant democracy, or out of an oligarchy; but it is not so likely to arise out of the middle constitutions and those akin to them. I will explain the reason of this hereafter, when I speak of the revolutions of states. The mean condition of states is clearly best, for no other is free from faction; and where the middle class is large, there are least likely to be factions and dissensions. For a similar reason large states are less liable to faction than small ones, because in them the middle class is large; whereas in small states it is easy to divide all the citizens into two classes who are either rich or poor, and to leave nothing in the middle. And democracies are safer and more permanent than oligarchies, because they have a middle class which is more numerous and has a greater share in the government; for when there is no middle class, and the poor greatly exceed in number, troubles arise, and the state soon comes to an end. A proof of the superiority of the middle dass is

that the best legislators have been of a middle condition; for example, Solon, as his own verses testify; and Lycurgus, for he was not a king; and Charondas, and almost all legislators.

These considerations will help us to understand why most governments are either democratical or oligarchical. The reason is that the middle class is seldom numerous in them, and whichever party, whether the rich or the common people, transgresses the mean and predominates, draws the constitution its own way, and thus arises either oligarchy or democracy. There is another reason – the poor and the rich quarrel with one another, and whichever side gets the better, instead of establishing a just or popular government, regards political supremacy as the prize of victory, and the one party sets up a democracy and the other an oligarchy. Further, both the parties which had the supremacy in Hellas looked only to the interest of their own form of government, and established in states, the one, democracies, and the other, oligarchies; they thought of their own advantage, of the public not at all. For these reasons the middle form of government has rarely, if ever, existed, and among a very few only. One man alone of all who ever ruled in Hellas was induced to give this middle constitution to states. But it has now become a habit among the citizens of states, not even to care about equality; all men are seeking for dominion, or, if conquered, are willing to submit.

What then is the best form of government, and what makes it the best, is evident; and of other constitutions, since we say that there are many kinds of democracy and many of oligarchy, it is not difficult to see which has the first and which the second or any other place in the order of excellence, now that we have determined which is the best. For that which is nearest to the best must of necessity be better, and that which is furthest from it worse, if we are judging absolutely and not relatively to given conditions: I say 'relatively to given conditions,' since a

particular government may be preferable, but another form may be better for some people.

12

We have now to consider what and what kind of government is suitable to what and what kind of men. I may begin by assuming, as a general principle common to all governments, that the portion of the state which desires the permanence of the constitution ought to be stronger than that which desires the reverse. Now every city is composed of quality and quantity. By quality I mean freedom, wealth, education, good birth, and by quantity, superiority of numbers. Quality may exist in one of the classes which make up the state, and quantity in the other. For example, the meanly-born may be more in number than the well-born, or the poor than the rich, yet they may not so much exceed in quantity as they fall short in quality; and therefore there must be a comparison of quantity and quality. Where the number of the poor is more than proportioned to the wealth of the rich, there will naturally be a democracy, varying in form with the sort of people who compose it in each case. If, for example, the husbandmen exceed in number, the first form of democracy will then arise; if the artisans and laboring class, the last; and so with the intermediate forms. But where the rich and the notables exceed in quality more than they fall short in quantity, there oligarchy arises, similarly assuming various forms according to the kind of superiority possessed by the oligarchs.

The legislator should always include the middle class in his government; if he makes his laws oligarchical, to the middle class let him look; if he makes them democratical, he should

equally by his laws try to attach this class to the state. There only can the government ever be stable where the middle class exceeds one or both of the others, and in that case there will be no fear that the rich will unite with the poor against the rulers. For neither of them will ever be willing to serve the other, and if they look for some form of government more suitable to both, they will find none better than this, for the rich and the poor will never consent to rule in turn, because they mistrust one another. The arbiter is always the one trusted, and he who is in the middle is an arbiter. The more perfect the admixture of the political elements, the more lasting will be the constitution. Many even of those who desire to form aristocratical governments make a mistake, not only in giving too much power to the rich, but in attempting to overreach the people. There comes a time when out of a false good there arises a true evil, since the encroachments of the rich are more destructive to the constitution than those of the people.

13

The devices by which oligarchies deceive the people are five in number; they relate to (1) the assembly; (2) the magistracies; (3) the courts of law; (4) the use of arms; (5) gymnastic exercises. (1) The assemblies are thrown open to all, but either the rich only are fined for non-attendance, or a much larger fine is inflicted upon them. (2) to the magistracies, those who are qualified by property cannot decline office upon oath, but the poor may. (3) In the law courts the rich, and the rich only, are fined if they do not serve, the poor are let off with impunity, or, as in the laws of Charondas, a larger fine is inflicted on the rich, and a smaller one on the poor. In some states all citizen who have registered themselves are allowed to attend the assembly and to try

causes; but if after registration they do not attend either in the assembly or at the courts, heavy fines are imposed upon them. The intention is that through fear of the fines they may avoid registering themselves, and then they cannot sit in the law-courts or in the assembly. concerning (4) the possession of arms, and (5) gymnastic exercises, they legislate in a similar spirit. For the poor are not obliged to have arms, but the rich are fined for not having them; and in like manner no penalty is inflicted on the poor for non-attendance at the gymnasium, and consequently, having nothing to fear, they do not attend, whereas the rich are liable to a fine, and therefore they take care to attend.

These are the devices of oligarchical legislators, and in democracies they have counter devices. They pay the poor for attending the assemblies and the law-courts, and they inflict no penalty on the rich for non-attendance. It is obvious that he who would duly mix the two principles should combine the practice of both, and provide that the poor should be paid to attend, and the rich fined if they do not attend, for then all will take part; if there is no such combination, power will be in the hands of one party only. The government should be confined to those who carry arms. As to the property qualification, no absolute rule can be laid down, but we must see what is the highest qualification sufficiently comprehensive to secure that the number of those who have the rights of citizens exceeds the number of those excluded. Even if they have no share in office, the poor, provided only that they are not outraged or deprived of their property, will be quiet enough.

But to secure gentle treatment for the poor is not an easy thing, since a ruling class is not always humane. And in time of war the poor are apt to hesitate unless they are fed; when fed, they are willing enough to fight. In some states the government is vested, not only in those who are actually serving, but also in

those who have served; among the Malians, for example, the governing body consisted of the latter, while the magistrates were chosen from those actually on service. And the earliest government which existed among the Hellenes, after the overthrow of the kingly power, grew up out of the warrior class, and was originally taken from the knights (for strength and superiority in war at that time depended on cavalry; indeed, without discipline, infantry are useless, and in ancient times there was no military knowledge or tactics, and therefore the strength of armies lay in their cavalry). But when cities increased and the heavy armed grew in strength, more had a share in the government; and this is the reason why the states which we call constitutional governments have been hitherto called democracies. Ancient constitutions, as might be expected, were oligarchical and royal; their population being small they had no considerable middle class; the people were weak in numbers and organization, and were therefore more contented to be governed.

I have explained why there are various forms of government, and why there are more than is generally supposed; for democracy, as well as other constitutions, has more than one form: also what their differences are, and whence they arise, and what is the best form of government, speaking generally and to whom the various forms of government are best suited; all this has now been explained.

14

Having thus gained an appropriate basis of discussion, we will proceed to speak of the points which follow next in order. We will consider the subject not only in general but with reference

to particular constitutions. All constitutions have three elements, concerning which the good lawgiver has to regard what is expedient for each constitution. When they are well-ordered, the constitution is well-ordered, and as they differ from one another, constitutions differ. There is (1) one element which deliberates about public affairs; secondly (2) that concerned with the magistrates – the question being, what they should be, over what they should exercise authority, and what should be the mode of electing to them; and thirdly (3) that which has judicial power.

The deliberative element has authority in matters of war and peace, in making and unmaking alliances; it passes laws, inflicts death, exile, confiscation, elects magistrates and audits their accounts. These powers must be assigned either all to all the citizens or an to some of them (for example, to one or more magistracies, or different causes to different magistracies), or some of them to all, and others of them only to some. That all things should be decided by all is characteristic of democracy; this is the sort of equality which the people desire. But there are various ways in which all may share in the government; they may deliberate, not all in one body, but by turns, as in the constitution of Telecles the Milesian. There are other constitutions in which the boards of magistrates meet and deliberate, but come into office by turns, and are elected out of the tribes and the very smallest divisions of the state, until every one has obtained office in his turn. The citizens, on the other hand, are assembled only for the purposes of legislation, and to consult about the constitution, and to hear the edicts of the magistrates. In another variety of democracy the citizen form one assembly, but meet only to elect magistrates, to pass laws, to advise about war and peace, and to make scrutinies. Other matters are referred severally to special magistrates, who are elected by vote or by lot out of all the citizens Or again, the citizens meet about election to offices and about scrutinies, and

deliberate concerning war or alliances while other matters are administered by the magistrates, who, as far as is possible, are elected by vote. I am speaking of those magistracies in which special knowledge is required. A fourth form of democracy is when all the citizens meet to deliberate about everything, and the magistrates decide nothing, but only make the preliminary inquiries; and that is the way in which the last and worst form of democracy, corresponding, as we maintain, to the close family oligarchy and to tyranny, is at present administered. All these modes are democratical.

On the other hand, that some should deliberate about all is oligarchical. This again is a mode which, like the democratical has many forms. When the deliberative class being elected out of those who have a moderate qualification are numerous and they respect and obey the prohibitions of the law without altering it, and any one who has the required qualification shares in the government, then, just because of this moderation, the oligarchy inclines towards polity. But when only selected individuals and not the whole people share in the deliberations of the state, then, although, as in the former case, they observe the law, the government is a pure oligarchy. Or, again, when those who have the power of deliberation are self-elected, and son succeeds father, and they and not the laws are supreme – the government is of necessity oligarchical. Where, again, particular persons have authority in particular matters – for example, when the whole people decide about peace and war and hold scrutinies, but the magistrates regulate everything else, and they are elected by vote – there the government is an aristocracy. And if some questions are decided by magistrates elected by vote, and others by magistrates elected by lot, either absolutely or out of select candidates, or elected partly by vote, partly by lot – these practices are partly characteristic of an aristocratical government, and party of a pure constitutional government.

These are the various forms of the deliberative body; they correspond to the various forms of government. And the government of each state is administered according to one or other of the principles which have been laid down. Now it is for the interest of democracy, according to the most prevalent notion of it (I am speaking of that extreme form of democracy in which the people are supreme even over the laws), with a view to better deliberation to adopt the custom of oligarchies respecting courts of law. For in oligarchies the rich who are wanted to be judges are compelled to attend under pain of a fine, whereas in deinocracies the poor are paid to attend. And this practice of oligarchies should be adopted by democracies in their public assemblies, for they will advise better if they all deliberate together – the people with the notables and the notables with the people. It is also a good plan that those who deliberate should be elected by vote or by lot in equal numbers out of the different classes; and that if the people greatly exceed in number those who have political training, pay should not be given to all, but only to as many as would balance the number of the notables, or that the number in excess should be eliminated by lot. But in oligarchies either certain persons should be co-opted from the mass, or a class of officers should be appointed such as exist in some states who are termed probuli and guardians of the law; and the citizens should occupy themselves exclusively with matters on which these have previously deliberated; for so the people will have a share in the deliberations of the state, but will not be able to disturb the principles of the constitution. Again, in oligarchies either the people ought to accept the measures of the government, or not to pass anything contrary to them; or, if all are allowed to share in counsel, the decision should rest with the magistrates. The opposite of what is done in constitutional governments should be the rule in oligarchies; the veto of the majority should be final, their assent not final, but the proposal should be

referred back to the magistrates. Whereas in constitutional governments they take the contrary course; the few have the negative, not the affirmative power; the affirmation of everything rests with the multitude.

These, then, are our conclusions respecting the deliberative, that is, the supreme element in states.

15

Next we will proceed to consider the distribution of offices; this too, being a part of politics concerning which many questions arise: What shall their number be? Over what shall they preside, and what shall be their duration? Sometimes they last for six months, sometimes for less; sometimes they are annual, while in other cases offices are held for still longer periods. Shall they be for life or for a long term of years; or, if for a short term only, shall the same persons hold them over and over again, or once only? Also about the appointment to them – from whom are they to be chosen, by whom, and how? We should first be in a position to say what are the possible varieties of them, and then we may proceed to determine which are suited to different forms of government. But what are to be included under the term 'offices'? That is a question not quite so easily answered. For a political community requires many officers; and not every one who is chosen by vote or by lot is to be regarded as a ruler. In the first place there are the priests, who must be distinguished from political officers; masters of choruses and heralds, even ambassadors, are elected by vote. Some duties of superintendence again are political, extending either to all the citizens in a single sphere of action, like the office of the general who superintends them when they are in the field, or to a

section of them only, like the inspectorships of women or of youth. Other offices are concerned with household management, like that of the corn measurers who exist in many states and are elected officers. There are also menial offices which the rich have executed by their slaves. Speaking generally, those are to be called offices to which the duties are assigned of deliberating about certain measures and ofjudging and commanding, especially the last; for to command is the especial duty of a magistrate. But the question is not of any importance in practice; no one has ever brought into court the meaning of the word, although such problems have a speculative interest.

What kinds of offices, and how many, are necessary to the existence of a state, and which, if not necessary, yet conduce to its well being are much more important considerations, affecting all constitutions, but more especially small states. For in great states it is possible, and indeed necessary, that every office should have a special function; where the citizens are numerous, many may hold office. And so it happens that some offices a man holds a second time only after a long interval, and others he holds once only; and certainly every work is better done which receives the sole, and not the divided attention of the worker. But in small states it is necessary to combine many offices in a few hands, since the small number of citizens does not admit of many holding office: for who will there be to succeed them? And yet small states at times require the same offices and laws as large ones; the difference is that the one want them often, the others only after long intervals. Hence there is no reason why the care of many offices should not be imposed on the same person, for they will not interfere with each other. When the population is small, offices should be like the spits which also serve to hold a lamp. We must first ascertain how many magistrates are necessary in every state, and also how many are not exactly necessary, but are

nevertheless useful, and then there will be no difficulty in seeing what offices can be combined in one. We should also know over which matters several local tribunals are to have jurisdiction, and in which authority should be centralized: for example, should one person keep order in the market and another in some other place, or should the same person be responsible everywhere? Again, should offices be divided according to the subjects with which they deal, or according to the persons with whom they deal: I mean to say, should one person see to good order in general, or one look after the boys, another after the women, and so on? Further, under different constitutions, should the magistrates be the same or different? For example, in democracy, oligarchy, aristocracy, monarchy, should there be the same magistrates, although they are elected, not out of equal or similar classes of citizen but differently under different constitutions – in aristocracies, for example, they are chosen from the educated, in oligarchies from the wealthy, and in democracies from the free – or are there certain differences in the offices answering to them as well, and may the same be suitable to some, but different offices to others? For in some states it may be convenient that the same office should have a more extensive, in other states a narrower sphere. Special offices are peculiar to certain forms of government: for example that of probuli, which is not a democratic office, although a bule or council is. There must be some body of men whose duty is to prepare measures for the people in order that they may not be diverted from their business; when these are few in number, the state inclines to an oligarchy: or rather the probuli must always be few, and are therefore an oligarchical element. But when both institutions exist in a state, the probuli are a check on the council; for the counselors is a democratic element, but the probuli are oligarchical. Even the power of the council disappears when democracy has taken that extreme form in which the people

themselves are always meeting and deliberating about everything. This is the case when the members of the assembly receive abundant pay; for they have nothing to do and are always holding assemblies and deciding everything for themselves. A magistracy which controls the boys or the women, or any similar office, is suited to an aristocracy rather than to a democracy; for how can the magistrates prevent the wives of the poor from going out of doors? Neither is it an oligarchical office; for the wives of the oligarchs are too fine to be controlled.

Enough of these matters. I will now inquire into appointments to offices. The varieties depend on three terms, and the combinations of these give all possible modes: first, who appoints? secondly, from whom? and thirdly, how? Each of these three admits of three varieties: (A) All the citizens, or (B) only some, appoint. Either (1) the magistrates are chosen out of all or (2) out of some who are distinguished either by a property qualification, or by birth, or merit, or for some special reason, as at Megara only those were eligible who had returned from exile and fought together against the democracy. They may be appointed either (a) by vote or (b) by lot. Again, these several varieties may be coupled, I mean that (C) some officers may be elected by some, others by all, and (3) some again out of some, and others out of all, and (c) some by vote and others by lot. Each variety of these terms admits of four modes.

For either (A 1 a) all may appoint from all by vote, or (A 1 b) all from all by lot, or (A 2 a) all from some by vote, or (A 2 b) all from some by lot (and from all, either by sections, as, for example, by tribes, and wards, and phratries, until all the citizens have been gone through; or the citizens may be in all cases eligible indiscriminately); or again (A 1 c, A 2 c) to some offices in the one way, to some in the other. Again, if it is only some that appoint, they may do so either (B 1 a) from all by vote,

or (B 1 b) from all by lot, or (B 2 a) from some by vote, or (B 2 b) from some by lot, or to some offices in the one way, to others in the other, i.e., (B 1 c) from all, to some offices by vote, to some by lot, and (B 2 C) from some, to some offices by vote, to some by lot. Thus the modes that arise, apart from two (C, 3) out of the three couplings, number twelve. Of these systems two are popular, that all should appoint from all (A 1 a) by vote or (A 1 b) by lot – or (A 1 c) by both. That all should not appoint at once, but should appoint from all or from some either by lot or by vote or by both, or appoint to some offices from all and to others from some ('by both' meaning to some offices by lot, to others by vote), is characteristic of a polity. And (B 1 c) that some should appoint from all, to some offices by vote, to others by lot, is also characteristic of a polity, but more oligarchical than the former method. And (A 3 a, b, c, B 3 a, b, c) to appoint from both, to some offices from all, to others from some, is characteristic of a polity with a leaning towards aristocracy. That (B 2) some should appoint from some is oligarchical – even (B 2 b) that some should appoint from some by lot (and if this does not actually occur, it is none the less oligarchical in character), or (B 2 C) that some should appoint from some by both. (B 1 a) that some should appoint from all, and (A 2 a) that all should appoint from some, by vote, is aristocratic.

These are the different modes of constituting magistrates, and these correspond to different forms of government: which are proper to which, or how they ought to be established, will be evident when we determine the nature of their powers. By powers I mean such powers as a magistrate exercises over the revenue or in defense of the country; for there are various kinds of power: the power of the general, for example, is not the same with that which regulates contracts in the market.

16

Of the three parts of government, the judicial remains to be considered, and this we shall divide on the same principle. There are three points on which the variedes of law-courts depend: The persons from whom they are appointed, the matters with which they are concerned, and the manner of their appointment. I mean, (1) are the judges taken from all, or from some only? (2) how many kinds of law-courts are there? (3) are the judges chosen by vote or by lot?

First, let me determine how many kinds of law-courts there are. There are eight in number: One is the court of audits or scrutinies; a second takes cognizance of ordinary offenses against the state; a third is concerned with treason against the constitution; the fourth determines disputes respecting penalties, whether raised by magistrates or by private persons; the fifth decides the more important civil cases; the sixth tries cases of homicide, which are of various kinds, (a) premeditated, (b) involuntary, (c) cases in which the guilt is confessed but the justice is disputed; and there may be a fourth court (d) in which murderers who have fled from justice are tried after their return; such as the Court of Phreatto is said to be at Athens. But cases of this sort rarely happen at all even in large cities. The different kinds of homicide may be tried either by the same or by different courts. (7) There are courts for strangers: of these there are two subdivisions, (a) for the settlement of their disputes with one another, (b) for the settlement of disputes between them and the citizens. And besides all these there must be (8) courts for small suits about sums of a drachma up to five drachmas, or a little more, which have to be determined, but they do not require many judges.

Nothing more need be said of these small suits, nor of the courts for homicide and for strangers: I would rather speak of political cases, which, when mismanaged, create division and disturbances in constitutions.

Now if all the citizens judge, in all the different cases which I have distinguished, they may be appointed by vote or by lot, or sometimes by lot and sometimes by vote. Or when a single class of causes are tried, the judges who decide them may be appointed, some by vote, and some by lot. These then are the four modes of appointing judges from the whole people, and there will be likewise four modes, if they are elected from a part only; for they may be appointed from some by vote and judge in all causes; or they may be appointed from some by lot and judge in all causes; or they may be elected in some cases by vote, and in some cases taken by lot, or some courts, even when judging the same causes, may be composed of members some appointed by vote and some by lot. These modes, then, as was said, answer to those previously mentioned.

Once more, the modes of appointment may be combined; I mean, that some may be chosen out of the whole people, others out of some, some out of both; for example, the same tribunal may be composed of some who were elected out of all, and of others who were elected out of some, either by vote or by lot or by both.

In how many forms law-courts can be established has now been considered. The first form, viz., that in which the judges are taken from all the citizens, and in which all causes are tried, is democratical; the second, which is composed of a few only who try all causes, oligarchical; the third, in which some courts are taken from all classes, and some from certain classes only, aristocratical and constitutional.

Book V

1

The design which we proposed to ourselves is now nearly completed. Next in order follow the causes of revolution in states, how many, and of what nature they are; what modes of destruction apply to particular states, and out of what, and into what they mostly change; also what are the modes of preservation in states generally, or in a particular state, and by what means each state may be best preserved: these questions remain to be considered.

In the first place we must assume as our starting-point that in the many forms of government which have sprung up there has always been an acknowledgment of justice and proportionate equality, although mankind fail attaining them, as I have already explained. Democracy, for example, arises out of the notion that those who are equal in any respect are equal in all respects; because men are equally free, they claim to be absolutely equal. Oligarchy is based on the notion that those who are unequal in one respect are in all respects unequal; being unequal, that is, in property, they suppose themselves to be unequal absolutely. The democrats think that as they are equal they ought to be equal in all things; while the oligarchs, under the idea that they are unequal, claim too much, which is one form of inequality. All these forms of government have a kind of justice, but, tried by an absolute standard, they are faulty; and, therefore, both parties, whenever their share in the

government does not accord with their preconceived ideas, stir up revolution. Those who excel in virtue have the best right of all to rebel (for they alone can with reason be deemed absolutely unequal), but then they are of all men the least inclined to do so. There is also a superiority which is claimed by men of rank; for they are thought noble because they spring from wealthy and virtuous ancestors. Here then, so to speak, are opened the very springs and fountains of revolution; and hence arise two sorts of changes in governments; the one affecting the constitution, when men seek to change from an existing form into some other, for example, from democracy into oligarchy, and from oligarchy into democracy, or from either of them into constitutional government or aristocracy, and conversely; the other not affecting the constitution, when, without disturbing the form of government, whether oligarchy, or monarchy, or any other, they try to get the administration into their own hands. Further, there is a question of degree; an oligarchy, for example, may become more or less oligarchical, and a democracy more or less democratical; and in like manner the characteristics of the other forms of government may be more or less strictly maintained. Or the revolution may be directed against a portion of the constitution only, e.g., the establishment or overthrow of a particular office: as at Sparta it is said that Lysander attempted to overthrow the monarchy, and King Pausanias, the Ephoralty. At Epidamnus, too, the change was partial. For instead of phylarchs or heads of tribes, a council was appointed; but to this day the magistrates are the only members of the ruling class who are compelled to go to the Heliaea when an election takes place, and the office of the single archon was another oligarchical feature. Everywhere inequality is a cause of revolution, but an inequality in which there is no proportion – for instance, a perpetual monarchy among equals; and always it is the desire of equality which rises in rebellion.

Now equality is of two kinds, numerical and proportional; by the first I mean sameness or equality in number or size; by the second, equality of ratios. For example, the excess of three over two is numerically equal to the excess of two over one; whereas four exceeds two in the same ratio in which two exceeds one, for two is the same part of four that one is of two, namely, the half. As I was saying before, men agree that justice in the abstract is proportion, but they differ in that some think that if they are equal in any respect they are equal absolutely, others that if they are unequal in any respect they should be unequal in all. Hence there are two principal forms of government, democracy and oligarchy; for good birth and virtue are rare, but wealth and numbers are more common. In what city shall we find a hundred persons of good birth and of virtue? whereas the rich everywhere abound. That a state should be ordered, simply and wholly, according to either kind of equality, is not a good thing; the proof is the fact that such forms of government never last. They are originally based on a mistake, and, as they begin badly, cannot fall to end badly. The inference is that both kinds of equality should be employed; numerical in some cases, and proportionate in others.

Still democracy appears to be safer and less liable to revolution than oligarchy. For in oligarchies there is the double danger of the oligarchs falling out among themselves and also with the people; but in democracies there is only the danger of a quarrel with the oligarchs. No dissension worth mentioning arises among the people themselves. And we may further remark that a government which is composed of the middle class more nearly approximates to democracy than to oligarchy, and is the safest of the imperfect forms of government.

2

In considering how dissensions and poltical revolutions arise, we must first of all ascertain the beginnings and causes of them which affect constitutions generally. They may be said to be three in number; and we have now to give an outline of each. We want to know (1) what is the feeling? (2) what are the motives of those who make them? (3) whence arise political disturbances and quarrels? The universal and chief cause of this revolutionary feeling has been already mentioned; viz., the desire of equality, when men think that they are equal to others who have more than themselves; or, again, the desire of inequality and superiority, when conceiving themselves to be superior they think that they have not more but the same or less than their inferiors; pretensions which may and may not be just. Inferiors revolt in order that they may be equal, and equals that they may be superior. Such is the state of mind which creates revolutions. The motives for making them are the desire of gain and honor, or the fear of dishonor and loss; the authors of them want to divert punishment or dishonor from themselves or their friends. The causes and reasons of revolutions, whereby men are themselves affected in the way described, and about the things which I have mentioned, viewed in one way may be regarded as seven, and in another as more than seven. Two of them have been already noticed; but they act in a different manner, for men are excited against one another by the love of gain and honor – not, as in the case which I have just supposed, in order to obtain them for themselves, but at seeing others, justly or unjustly, engrossing them. Other causes are insolence, fear, excessive predominance, contempt, disproportionate increase in some part of the state; causes of another sort are election intrigues, carelessness, neglect about trifles, dissimilarity of elements.

3

What share insolence and avarice have in creating revolutions, and how they work, is plain enough. When the magistrates are insolent and grasping they conspire against one another and also against the constitution from which they derive their power, making their gains either at the expense of individuals or of the public. It is evident, again, what an influence honor exerts and how it is a cause of revolution. Men who are themselves dishonored and who see others obtaining honors rise in rebellion; the honor or dishonor when undeserved is unjust; and just when awarded according to merit.

Again, superiority is a cause of revolution when one or more persons have a power which is too much for the state and the power of the government; this is a condition of affairs out of which there arises a monarchy, or a family oligarchy. And therefore, in some places, as at Athens and Argos, they have recourse to ostracism. But how much better to provide from the first that there should be no such pre-eminent individuals instead of letting them come into existence and then finding a remedy.

Another cause of revolution is fear. Either men have committed wrong, and are afraid of punishment, or they are expecting to suffer wrong and are desirous of anticipating their enemy. Thus at Rhodes the notables conspired against the people through fear of the suits that were brought against them. Contempt is also a cause of insurrection and revolution; for example, in oligarchies – when those who have no share in the state are the majority, they revolt, because they think that they are the stronger. Or, again, in democracies, the rich despise the disorder and anarchy of the state; at Thebes, for example, where, after the battle of Oenophyta, the bad administration of the

democracy led to its ruin. At Megara the fall of the democracy was due to a defeat occasioned by disorder and anarchy. And at Syracuse the democracy aroused contempt before the tyranny of Gelo arose; at Rhodes, before the insurrection.

Political revolutions also spring from a disproportionate increase in any part of the state. For as a body is made up of many members, and every member ought to grow in proportion, that symmetry may be preserved; but loses its nature if the foot be four cubits long and the rest of the body two spans; and, should the abnormal increase be one of quality as well as of quantity, may even take the form of another animal: even so a state has many parts, of which some one may often grow imperceptibly; for example, the number of poor in democracies and in constitutional states. And this disproportion may sometimes happen by an accident, as at Tarentum, from a defeat in which many of the notables were slain in a battle with the Iapygians just after the Persian War, the constitutional government in consequence becoming a democracy; or as was the case at Argos, where the Argives, after their army had been cut to pieces on the seventh day of the month by Cleomenes the Lacedaemonian, were compelled to admit to citizen some of their Perioeci; and at Athens, when, after frequent defeats of their infantry at the time of the Peloponnesian War, the notables were reduced in number, because the soldiers had to be taken from the roll of citizens. Revolutions arise from this cause as well, in democracies as in other forms of government, but not to so great an extent. When the rich grow numerous or properties increase, the form of government changes into an oligarchy or a government of families. Forms of government also change – sometimes even without revolution, owing to election contests, as at Heraea (where, instead of electing their magistrates, they took them by lot, because the electors were in the habit of choosing their own partisans); or owing to carelessness, when disloyal persons are allowed to find their

way into the highest offices, as at Oreum, where, upon the accession of Heracleodorus to office, the oligarchy was overthrown, and changed by him into a constitutional and democratical government.

Again, the revolution may be facilitated by the slightness of the change; I mean that a great change may sometimes slip into the constitution through neglect of a small matter; at Ambracia, for instance, the qualification for office, small at first, was eventually reduced to nothing. For the Ambraciots thought that a small qualification was much the same as none at all.

Another cause of revolution is difference of races which do not at once acquire a common spirit; for a state is not the growth of a day, any more than it grows out of a multitude brought together by accident. Hence the reception of strangers in colonies, either at the time of their foundation or afterwards, has generally produced revolution; for example, the Achaeans who joined the Troezenians in the foundation of Sybaris, becoming later the more numerous, expelled them; hence the curse fell upon Sybaris. At Thurii the Sybarites quarrelled with their fellow-colonists; thinking that the land belonged to them, they wanted too much of it and were driven out. At Byzantium the new colonists were detected in a conspiracy, and were expelled by force of arms; the people of Antissa, who had received the Chian exiles, fought with them, and drove them out; and the Zancleans, after having received the Samians, were driven by them out of their own city. The citizens of Apollonia on the Euxine, after the introduction of a fresh body of colonists, had a revolution; the Syracusans, after the expulsion of their tyrants, having admitted strangers and mercenaries to the rights of citizenship, quarrelled and came to blows; the people of Amphipolis, having received Chalcidian colonists, were nearly all expelled by them.

Now, in oligarchies the masses make revolution under the idea that they are unjustly treated, because, as I said before, they are equals, and have not an equal share, and in democracies the notables revolt, because they are not equals, and yet have only an equal share.

Again, the situation of cities is a cause of revolution when the country is not naturally adapted to preserve the unity of the state. For example, the Chytians at Clazomenae did not agree with the people of the island; and the people of Colophon quarrelled with the Notians; at Athens too, the inhabitants of the Piraeus are more democratic than those who live in the city. For just as in war the impediment of a ditch, though ever so small, may break a regiment, so every cause of difference, however slight, makes a breach in a city. The greatest opposition is confessedly that of virtue and vice; next comes that of wealth and poverty; and there are other antagonistic elements, greater or less, of which one is this difference of place.

4

In revolutions the occasions may be trifling, but great interests are at stake. Even trifles are most important when they concern the rulers, as was the case of old at Syracuse; for the Syracusan constitution was once changed by a love-quarrel of two young men, who were in the government. The story is that while one of them was away from home his beloved was gained over by his companion, and he to revenge himself seduced the other's wife. They then drew the members of the ruling class into their quarrel and so split all the people into portions. We learn from this story that we should be on our guard against the beginnings of such evils, and should put an end to the quarrels

of chiefs and mighty men. The mistake lies in the beginning – as the proverb says – 'Well begun is half done'; so an error at the beginning, though quite small, bears the same ratio to the errors in the other parts. In general, when the notables quarrel, the whole city is involved, as happened in Hesdaea after the Persian War. The occasion was the division of an inheritance; one of two brothers refused to give an account of their father's property and the treasure which he had found: so the poorer of the two quarrelled with him and enlisted in his cause the popular party, the other, who was very rich, the wealthy classes.

At Delphi, again, a quarrel about a marriage was the beginning of all the troubles which followed. In this case the bridegroom, fancying some occurrence to be of evil omen, came to the bride, and went away without taking her. Whereupon her relations, thinking that they were insulted by him, put some of the sacred treasure among his offerings while he was sacrificing, and then slew him, pretending that he had been robbing the temple. At Mytilene, too, a dispute about heiresses was the beginning of many misfortunes, and led to the war with the Athenians in which Paches took their city. A wealthy citizen, named Timophanes, left two daughters; Dexander, another citizen, wanted to obtain them for his sons; but he was rejected in his suit, whereupon he stirred up a revolution, and instigated the Athenians (of whom he was proxenus) to interfere. A similar quarrel about an heiress arose at Phocis between Mnaseas the father of Mnason, and Euthycrates the father of Onomarchus; this was the beginning of the Sacred War. A marriage-quarrel was also the cause of a change in the government of Epidamnus. A certain man betrothed his daughter to a person whose father, having been made a magistrate, fined the father of the girl, and the latter, stung by the insult, conspired with the unenfranchised classes to overthrow the state.

Governments also change into oligarchy or into democracy or into a constitutional government because the magistrates, or some other section of the state, increase in power or renown. Thus at Athens the reputation gained by the court of the Areopagus, in the Persian War, seemed to tighten the reins of government. On the other hand, the victory of Salamis, which was gained by the common people who served in the fleet, and won for the Athenians the empire due to command of the sea, strengthened the democracy. At Argos, the notables, having distinguished themselves against the Lacedaemonians in the battle of Mantinea, attempted to put down the democracy. At Syracuse, the people, having been the chief authors of the victory in the war with the Athenians, changed the constitutional government into democracy. At Chalcis, the people, uniting with the notables, killed Phoxus the tyrant, and then seized the government. At Ambracia, the people, in like manner, having joined with the conspirators in expelling the tyrant Periander, transferred the government to themselves. And generally it should be remembered that those who have secured power to the state, whether private citizens, or magistrates, or tribes, or any other part or section of the state, are apt to cause revolutions. For either envy of their greatness draws others into rebellion, or they themselves, in their pride of superiority, are unwilling to remain on a level with others.

Revolutions also break out when opposite parties, e.g., the rich and the people, are equally balanced, and there is little or no middle class; for, if either party were manifestly superior, the other would not risk an attack upon them. And, for this reason, those who are eminent in virtue usually do not stir up insurrections, always being a minority. Such are the beginnings and causes of the disturbances and revolutions to which every form of government is liable.

Revolutions are effected in two ways, by force and by fraud. Force may be applied either at the time of making the revolution or afterwards. Fraud, again, is of two kinds; for (1) sometimes the citizens are deceived into acquiescing in a change of government, and afterwards they are held in subjection against their will. This was what happened in the case of the Four Hundred, who deceived the people by telling them that the king would provide money for the war against the Lacedaemonians, and, having cheated the people, still endeavored to retain the government. (2) In other cases the people are persuaded at first, and afterwards, by a repetition of the persuasion, their goodwill and allegiance are retained. The revolutions which effect constitutions generally spring from the above-mentioned causes.

5

And now, taking each constitution separately, we must see what follows from the principles already laid down.

Revolutions in democracies are generally caused by the intemperance of demagogues, who either in their private capacity lay information against rich men until they compel them to combine (for a common danger unites even the bitterest enemies), or coming forward in public stir up the people against them. The truth of this remark is proved by a variety of examples. At Cos the democracy was overthrown because wicked demagogues arose, and the notables combined. At Rhodes the demagogues not only provided pay for the multitude, but prevented them from making good to the trierarchs the sums which had been expended by them; and they, in consequence of the suits which were brought against

them, were compelled to combine and put down the democracy. The democracy at Heraclea was overthrown shortly after the foundation of the colony by the injustice of the demagogues, which drove out the notables, who came back in a body and put an end to the democracy. Much in the same manner the democracy at Megara was overturned; there the demagogues drove out many of the notables in order that they might be able to confiscate their property. At length the exiles, becoming numerous, returned, and, engaging and defeating the people, established the oligarchy. The same thing happened with the democracy of Cyme, which was overthrown by Thrasymachus. And we may observe that in most states the changes have been of this character. For sometimes the demagogues, in order to curry favor with the people, wrong the notables and so force them to combine; either they make a division of their property, or diminish their incomes by the imposition of public services, and sometimes they bring accusations against the rich that they may have their wealth to confiscate.

Of old, the demagogue was also a general, and then democracies changed into tyrannies. Most of the ancient tyrants were originally demagogues. They are not so now, but they were then; and the reason is that they were generals and not orators, for oratory had not yet come into fashion. Whereas in our day, when the art of rhetoric has made such progress, the orators lead the people, but their ignorance of military matters prevents them from usurping power; at any rate instances to the contrary are few and slight. Tyrannies were more common formerly than now, for this reason also, that great power was placed in the hands of individuals; thus a tyranny arose at Miletus out of the office of the Prytanis, who had supreme authority in many important matters. Moreover, in those days, when cities were not large, the people dwelt in the fields, busy at their work; and their chiefs, if they possessed any military talent, seized the opportunity, and winning the confidence of

the masses by professing their hatred of the wealthy, they succeeded in obtaining the tyranny. Thus at Athens Peisistratus led a faction against the men of the plain, and Theagenes at Megara slaughtered the cattle of the wealthy, which he found by the river side, where they had put them to graze in land not their own. Dionysius, again, was thought worthy of the tyranny because he denounced Daphnaeus and the rich; his enmity to the notables won for him the confidence of the people. Changes also take place from the ancient to the latest form of democracy; for where there is a popular election of the magistrates and no property qualification, the aspirants for office get hold of the people, and contrive at last even to set them above the laws. A more or less complete cure for this state of things is for the separate tribes, and not the whole people, to elect the magistrates.

These are the principal causes of revolutions in democracies.

6

There are two patent causes of revolutions in oligarchies: (1) First, when the oligarchs oppress the people, for then anybody is good enough to be their champion, especially if he be himself a member of the oligarchy, as Lygdamis at Naxos, who afterwards came to be tyrant. But revolutions which commence outside the governing class may be further subdivided. Sometimes, when the government is very exclusive, the revolution is brought about by persons of the wealthy class who are excluded, as happened at Massalia and Istros and Heraclea, and other cities. Those who had no share in the government created a disturbance, until first the elder brothers, and then the younger, were admitted; for in some places father and son, in others

elder and younger brothers, do not hold office together. At Massalia the oligarchy became more like a constitutional government, but at Istros ended in a democracy, and at Heraclea was enlarged to 600. At Cnidos, again, the oligarchy underwent a considerable change. For the notables fell out among themselves, because only a few shared in the government; there existed among them the rule already mentioned, that father and son not hold office together, and, if there were several brothers, only the eldest was admitted. The people took advantage of the quarrel, and choosing one of the notables to be their leader, attacked and conquered the oligarchs, who were divided, and division is always a source of weakness. The city of Erythrae, too, in old times was ruled, and ruled well, by the Basilidae, but the people took offense at the narrowness of the oligarchy and changed the constitution.

(2) Of internal causes of revolutions in oligarchies one is the personal rivalry of the oligarchs, which leads them to play the demagogue. Now, the oligarchical demagogue is of two sorts: either (a) he practices upon the oligarchs themselves (for, although the oligarchy are quite a small number, there may be a demagogue among them, as at Athens Charicles' party won power by courting the Thirty, that of Phrynichus by courting the Four Hundred); or (b) the oligarchs may play the demagogue with the people. This was the case at Larissa, where the guardians of the citizens endeavored to gain over the people because they were elected by them; and such is the fate of all oligarchies in which the magistrates are elected, as at Abydos, not by the class to which they belong, but by the heavy-armed or by the people, although they may be required to have a high qualification, or to be members of a political club; or, again, where the law-courts are composed of persons outside the government, the oligarchs flatter the people in order to obtain a decision in their own favor, and so they change the constitution; this happened at Heraclea in Pontus. Again, oligarchies change

whenever any attempt is made to narrow them; for then those who desire equal rights are compelled to call in the people. Changes in the oligarchy also occur when the oligarchs waste their private property by extravagant living; for then they want to innovate, and either try to make themselves tyrants, or install some one else in the tyranny, as Hipparinus did Dionysius at Syracuse, and as at Amphipolis a man named Cleotimus introduced Chalcidian colonists, and when they arrived, stirred them up against the rich. For a like reason in Aegina the person who carried on the negotiation with Chares endeavored to revolutionize the state. Sometimes a party among the oligarchs try directly to create a political change; sometimes they rob the treasury, and then either the thieves or, as happened at Apollonia in Pontus, those who resist them in their thieving quarrel with the rulers. But an oligarchy which is at unity with itself is not easily destroyed from within; of this we may see an example at Pharsalus, for there, although the rulers are few in number, they govern a large city, because they have a good understanding among themselves.

Oligarchies, again, are overthrown when another oligarchy is created within the original one, that is to say, when the whole governing body is small and yet they do not all share in the highest offices. Thus at Elis the governing body was a small senate; and very few ever found their way into it, because the senators were only ninety in number, and were elected for life and out of certain families in a manner similar to the Lacedaemonian elders. Oligarchy is liable to revolutions alike in war and in peace; in war because, not being able to trust the people, the oligarchs are compelled to hire mercenaries, and the general who is in command of them often ends in becoming a tyrant, as Timophanes did at Corinth; or if there are more generals than one they make themselves into a company of tyrants. Sometimes the oligarchs, fearing this danger, give the people a share in the government because their services are

necessary to them. And in time of peace, from mutual distrust, the two parties hand over the defense of the state to the army and to an arbiter between the two factions, who often ends the master of both. This happened at Larissa when Simos the Aleuad had the government, and at Abydos in the days of Iphiades and the political clubs. Revolutions also arise out of marriages or lawsuits which lead to the overthrow of one party among the oligarchs by another. Of quarrels about marriages I have already mentioned some instances; another occurred at Eretria, where Diagoras overturned the oligarchy of the knights because he had been wronged about a marriage. A revolution at Heraclea, and another at Thebes, both arose out of decisions of law-courts upon a charge of adultery; in both cases the punishment was just, but executed in the spirit of party, at Heraclea upon Eurytion, and at Thebes upon Archias; for their enemies were jealous of them and so had them pilloried in the agora. Many oligarchies have been destroyed by some members of the ruling class taking offense at their excessive despotism; for example, the oligarchy at Cnidus and at Chios.

Changes of constitutional governments, and also of oligarchies which limit the office of counselor, judge, or other magistrate to persons having a certain money qualification, often occur by accident. The qualification may have been originally fixed according to the circumstances of the time, in such a manner as to include in an oligarchy a few only, or in a constitutional government the middle class. But after a time of prosperity, whether arising from peace or some other good fortune, the same property becomes many times as valuable, and then everybody participates in every office; this happens sometimes gradually and insensibly, and sometimes quickly. These are the causes of changes and revolutions in oligarchies.

We must remark generally both of democracies and oligarchies, that they sometimes change, not into the opposite forms of

government, but only into another variety of the same class; I mean to say, from those forms of democracy and oligarchy which are regulated by law into those which are arbitrary, and conversely.

7

In aristocracies revolutions are stirred up when a few only share in the honors of the state; a cause which has been already shown to affect oligarchies; for an aristocracy is a sort of oligarchy, and, like an oligarchy, is the government of a few, although few not for the same reason; hence the two are often confounded. And revolutions will be most likely to happen, and must happen, when the mass of the people are of the high-spirited kind, and have a notion that they are as good as their rulers. Thus at Lacedaemon the so-called Partheniae, who were the [illegitimate] sons of the Spartan peers, attempted a revolution, and, being detected, were sent away to colonize Tarentum. Again, revolutions occur when great men who are at least of equal merit are dishonored by those higher in office, as Lysander was by the kings of Sparta; or, when a brave man is excluded from the honors of the state, like Cinadon, who conspired against the Spartans in the reign of Agesilaus; or, again, when some are very poor and others very rich, a state of society which is most often the result of war, as at Lacedaemon in the days of the Messenian War; this is proved from the poem of Tyrtaeus, entitled ‘Good Order’; for he speaks of certain citizens who were ruined by the war and wanted to have a redistribution of the land. Again, revolutions arise when an individual who is great, and might be greater, wants to rule alone, as, at Lacedaemon, Pausanias, who was general in the Persian War, or like Hanno at Carthage.

Constitutional governments and aristocracies are commonly overthrown owing to some deviation from justice in the constitution itself; the cause of the downfall is, in the former, the ill-mingling of the two elements, democracy and oligarchy; in the latter, of the three elements, democracy, oligarchy, and virtue, but especially democracy and oligarchy. For to combine these is the endeavor of constitutional governments; and most of the so-called aristocracies have a like aim, but differ from polities in the mode of combination; hence some of them are more and some less permanent. Those which incline more to oligarchy are called aristocracies, and those which incline to democracy constitutional governments. And therefore the latter are the safer of the two; for the greater the number, the greater the strength, and when men are equal they are contented. But the rich, if the constitution gives them power, are apt to be insolent and avaricious; and, in general, whichever way the constitution inclines, in that direction it changes as either party gains strength, a constitutional government becoming a democracy, an aristocracy an oligarchy. But the process may be reversed, and aristocracy may change into democracy. This happens when the poor, under the idea that they are being wronged, force the constitution to take an opposite form. In like manner constitutional governments change into oligarchies. The only stable principle of government is equality according to proportion, and for every man to enjoy his own.

What I have just mentioned actually happened at Thurii, where the qualification for office, at first high, was therefore reduced, and the magistrates increased in number. The notables had previously acquired the whole of the land contrary to law; for the government tended to oligarchy, and they were able to encroach.... But the people, who had been trained by war, soon got the better of the guards kept by the oligarchs, until those who had too much gave up their land.

Again, since all aristocratical governments incline to oligarchy, the notables are apt to be grasping; thus at Lacedaemon, where property tends to pass into few hands, the notables can do too much as they like, and are allowed to marry whom they please. The city of Locri was ruined by a marriage connection with Dionysius, but such a thing could never have happened in a democracy, or in a wellbalanced aristocracy.

I have already remarked that in all states revolutions are occasioned by trifles. In aristocracies, above all, they are of a gradual and imperceptible nature. The citizens begin by giving up some part of the constitution, and so with greater ease the government change something else which is a little more important, until they have undermined the whole fabric of the state. At Thurii there was a law that generals should only be re-elected after an interval of five years, and some young men who were popular with the soldiers of the guard for their military prowess, despising the magistrates and thinking that they would easily gain their purpose, wanted to abolish this law and allow their generals to hold perpetual commands; for they well knew that the people would be glad enough to elect them. Whereupon the magistrates who had charge of these matters, and who are called councillors, at first determined to resist, but they afterwards consented, thinking that, if only this one law was changed, no further inroad would be made on the constitution. But other changes soon followed which they in vain attempted to oppose; and the state passed into the hands of the revolutionists, who established a dynastic oligarchy.

All constitutions are overthrown either from within or from without; the latter, when there is some government close at hand having an opposite interest, or at a distance, but powerful. This was exemplified in the old times of the Athenians and the Lacedaemonians; the Athenians everywhere put down the oligarchies, and the Lacedaemonians the democracies.

I have now explained what are the chief causes of revolutions and dissensions in states.

8

We have next to consider what means there are of preserving constitutions in general, and in particular cases. In the first place it is evident that if we know the causes which destroy constitutions, we also know the causes which preserve them; for opposites produce opposites, and destruction is the opposite of preservation.

In all well-attempered governments there is nothing which should be more jealously maintained than the spirit of obedience to law, more especially in small matters; for transgression creeps in unperceived and at last ruins the state, just as the constant recurrence of small expenses in time eats up a fortune. The expense does not take place at once, and therefore is not observed; the mind is deceived, as in the fallacy which says that 'if each part is little, then the whole is little.' this is true in one way, but not in another, for the whole and the all are not little, although they are made up of littles.

In the first place, then, men should guard against the beginning of change, and in the second place they should not rely upon the political devices of which I have already spoken invented only to deceive the people, for they are proved by experience to be useless. Further, we note that oligarchies as well as aristocracies may last, not from any inherent stability in such forms of government, but because the rulers are on good terms both with the unenfranchised and with the governing classes, not maltreating any who are excluded from the government, but introducing into it the leading spirits among them. They

should never wrong the ambitious in a matter of honor, or the common people in a matter of money; and they should treat one another and their fellow citizen in a spirit of equality. The equality which the friends of democracy seek to establish for the multitude is not only just but likewise expedient among equals. Hence, if the governing class are numerous, many democratic institutions are useful; for example, the restriction of the tenure of offices to six months, that all those who are of equal rank may share in them. Indeed, equals or peers when they are numerous become a kind of democracy, and therefore demagogues are very likely to arise among them, as I have already remarked. The short tenure of office prevents oligarchies and aristocracies from falling into the hands of families; it is not easy for a person to do any great harm when his tenure of office is short, whereas long possession begets tyranny in oligarchies and democracies. For the aspirants to tyranny are either the principal men of the state, who in democracies are demagogues and in oligarchies members of ruling houses, or those who hold great offices, and have a long tenure of them.

Constitutions are preserved when their destroyers are at a distance, and sometimes also because they are near, for the fear of them makes the government keep in hand the constitution. Wherefore the ruler who has a care of the constitution should invent terrors, and bring distant dangers near, in order that the citizens may be on their guard, and, like sentinels in a night watch, never relax their attention. He should endeavor too by help of the laws to control the contentions and quarrels of the notables, and to prevent those who have not hitherto taken part in them from catching the spirit of contention. No ordinary man can discern the beginning of evil, but only the true statesman.

As to the change produced in oligarchies and constitutional governments by the alteration of the qualification, when this

arises, not out of any variation in the qualification but only out of the increase of money, it is well to compare the general valuation of property with that of past years, annually in those cities in which the census is taken annually and in larger cities every third or fifth year. If the whole is many times greater or many times less than when the ratings recognized by the constitution were fixed, there should be power given by law to raise or lower the qualification as the amount is greater or less. Where this is not done a constitutional government passes into an oligarchy, and an oligarchy is narrowed to a rule of families; or in the opposite case constitutional government becomes democracy, and oligarchy either constitutional government or democracy.

It is a principle common to democracy, oligarchy, and every other form of government not to allow the disproportionate increase of any citizen but to give moderate honor for a long time rather than great honor for a short time. For men are easily spoilt; not every one can bear prosperity. But if this rule is not observed, at any rate the honors which are given all at once should be taken away by degrees and not all at once. Especially should the laws provide against any one having too much power, whether derived from friends or money; if he has, he should be sent clean out of the country. And since innovations creep in through the private life of individuals also, there ought to be a magistracy which will have an eye to those whose life is not in harmony with the government, whether oligarchy or democracy or any other. And for a like reason an increase of prosperity in any part of the state should be carefully watched. The proper remedy for this evil is always to give the management of affairs and offices of state to opposite elements; such opposites are the virtuous and the many, or the rich and the poor. Another way is to combine the poor and the rich in one body, or to increase the middle class: thus an end will be put to the revolutions which arise from inequality.

But above all every state should be so administered and so regulated by law that its magistrates cannot possibly make money. In oligarchies special precautions should be used against this evil. For the people do not take any great offense at being kept out of the government – indeed they are rather pleased than otherwise at having leisure for their private business – but what irritates them is to think that their rulers are stealing the public money; then they are doubly annoyed; for they lose both honor and profit. If office brought no profit, then and then only could democracy and aristocracy be combined; for both notables and people might have their wishes gratified. All would be able to hold office, which is the aim of democracy, and the notables would be magistrates, which is the aim of aristocracy. And this result may be accomplished when there is no possibility of making money out of the offices; for the poor will not want to have them when there is nothing to be gained from them – they would rather be attending to their own concerns; and the rich, who do not want money from the public treasury, will be able to take them; and so the poor will keep to their work and grow rich, and the notables will not be governed by the lower class. In order to avoid peculation of the public money, the transfer of the revenue should be made at a general assembly of the citizens, and duplicates of the accounts deposited with the different brotherhoods, companies, and tribes. And honors should be given by law to magistrates who have the reputation of being incorruptible. In democracies the rich should be spared; not only should their property not be divided, but their incomes also, which in some states are taken from them imperceptibly, should be protected. It is a good thing to prevent the wealthy citizens, even if they are willing from undertaking expensive and useless public services, such as the giving of choruses, torch-races, and the like. In an oligarchy, on the other hand, great care should be taken of the poor, and lucrative offices

should go to them; if any of the wealthy classes insult them, the offender should be punished more severely than if he had wronged one of his own class. Provision should be made that estates pass by inheritance and not by gift, and no person should have more than one inheritance; for in this way properties will be equalized, and more of the poor rise to competency. It is also expedient both in a democracy and in an oligarchy to assign to those who have less share in the government (i.e., to the rich in a democracy and to the poor in an oligarchy) an equality or preference in all but the principal offices of state. The latter should be entrusted chiefly or only to members of the governing class.

9

There are three qualifications required in those who have to fill the highest offices – (1) first of all, loyalty to the established constitution; (2) the greatest administrative capacity; (3) virtue and justice of the kind proper to each form of government; for, if what is just is not the same in all governments, the quality of justice must also differ. There may be a doubt, however, when all these qualities do not meet in the same person, how the selection is to be made; suppose, for example, a good general is a bad man and not a friend to the constitution, and another man is loyal and just, which should we choose? In making the election ought we not to consider two points? what qualities are common, and what are rare. Thus in the choice of a general, we should regard his skill rather than his virtue; for few have military skill, but many have virtue. In any office of trust or stewardship, on the other hand, the opposite rule should be observed; for more virtue than ordinary is required in the holder

of such an office, but the necessary knowledge is of a sort which all men possess.

It may, however, be asked what a man wants with virtue if he have political ability and is loyal, since these two qualities alone will make him do what is for the public interest. But may not men have both of them and yet be deficient in self-control? If, knowing and loving their own interests, they do not always attend to them, may they not be equally negligent of the interests of the public?

Speaking generally, we may say that whatever legal enactments are held to be for the interest of various constitutions, all these preserve them. And the great preserving principle is the one which has been repeatedly mentioned – to have a care that the loyal citizen should be stronger than the disloyal. Neither should we forget the mean, which at the present day is lost sight of in perverted forms of government; for many practices which appear to be democratical are the ruin of democracies, and many which appear to be oligarchical are the ruin of oligarchies. Those who think that all virtue is to be found in their own party principles push matters to extremes; they do not consider that disproportion destroys a state. A nose which varies from the ideal of straightness to a hook or snub may still be of good shape and agreeable to the eye; but if the excess be very great, all symmetry is lost, and the nose at last ceases to be a nose at all on account of some excess in one direction or defect in the other; and this is true of every other part of the human body. The same law of proportion equally holds in states. Oligarchy or democracy, although a departure from the most perfect form, may yet be a good enough government, but if any one attempts to push the principles of either to an extreme, he will begin by spoiling the government and end by having none at all. Wherefore the legislator and the statesman ought to know what democratical measures save and what destroy a

democracy, and what oligarchical measures save or destroy an oligarchy. For neither the one nor the other can exist or continue to exist unless both rich and poor are included in it. If equality of property is introduced, the state must of necessity take another form; for when by laws carried to excess one or other element in the state is ruined, the constitution is ruined.

There is an error common both to oligarchies and to democracies: in the latter the demagogues, when the multitude are above the law, are always cutting the city in two by quarrels with the rich, whereas they should always profess to be maintaining their cause; just as in oligarchies the oligarchs should profess to maintaining the cause of the people, and should take oaths the opposite of those which they now take. For there are cities in which they swear – 'I will be an enemy to the people, and will devise all the harm against them which I can'; but they ought to exhibit and to entertain the very opposite feeling; in the form of their oath there should be an express declaration – 'I will do no wrong to the people.'

But of all the things which I have mentioned that which most contributes to the permanence of constitutions is the adaptation of education to the form of government, and yet in our own day this principle is universally neglected. The best laws, though sanctioned by every citizen of the state, will be of no avail unless the young are trained by habit and education in the spirit of the constitution, if the laws are democratical, democratically or oligarchically, if the laws are oligarchical. For there may be a want of self-discipline in states as well as in individuals. Now, to have been educated in the spirit of the constitution is not to perform the actions in which oligarchs or democrats delight, but those by which the existence of an oligarchy or of a democracy is made possible. Whereas among ourselves the sons of the ruling class in an oligarchy live in luxury, but the sons of the poor are hardened by exercise and

toil, and hence they are both more inclined and better able to make a revolution. And in democracies of the more extreme type there has arisen a false idea of freedom which is contradictory to the true interests of the state. For two principles are characteristic of democracy, the government of the majority and freedom. Men think that what is just is equal; and that equality is the supremacy of the popular will; and that freedom means the doing what a man likes. In such democracies every one lives as he pleases, or in the words of Euripides, 'according to his fancy.' But this is all wrong; men should not think it slavery to live according to the rule of the constitution; for it is their salvation.

I have now discussed generally the causes of the revolution and destruction of states, and the means of their preservation and continuance.

10

I have still to speak of monarchy, and the causes of its destruction and preservation. What I have said already respecting forms of constitutional government applies almost equally to royal and to tyrannical rule. For royal rule is of the nature of an aristocracy, and a tyranny is a compound of oligarchy and democracy in their most extreme forms; it is therefore most injurious to its subjects, being made up of two evil forms of government, and having the perversions and errors of both. These two forms of monarchy are contrary in their very origin. The appointment of a king is the resource of the better classes against the people, and he is elected by them out of their own number, because either he himself or his family excel in virtue and virtuous actions; whereas a tyrant is

chosen from the people to be their protector against the notables, and in order to prevent them from being injured. History shows that almost all tyrants have been demagogues who gained the favor of the people by their accusation of the notables. At any rate this was the manner in which the tyrannies arose in the days when cities had increased in power. Others which were older originated in the ambition of kings wanting to overstep the limits of their hereditary power and become despots. Others again grew out of the class which were chosen to be chief magistrates; for in ancient times the people who elected them gave the magistrates, whether civil or religious, a long tenure. Others arose out of the custom which oligarchies had of making some individual supreme over the highest offices. In any of these ways an ambitious man had no difficulty, if he desired, in creating a tyranny, since he had the power in his hands already, either as king or as one of the officers of state. Thus Pheidon at Argos and several others were originally kings, and ended by becoming tyrants; Phalaris, on the other hand, and the Ionian tyrants, acquired the tyranny by holding great offices. Whereas Panaetius at Leontini, Cypselus at Corinth, Peisistratus at Athens, Dionysius at Syracuse, and several others who afterwards became tyrants, were at first demagogues.

And so, as I was saying, royalty ranks with aristocracy, for it is based upon merit, whether of the individual or of his family, or on benefits conferred, or on these claims with power added to them. For all who have obtained this honor have benefited, or had in their power to benefit, states and nations; some, like Codrus, have prevented the state from being enslaved in war; others, like Cyrus, have given their country freedom, or have settled or gained a territory, like the Lacedaemonian, Macedonian, and Molossian kings. The idea of a king is to be a protector of the rich against unjust treatment, of the people against insult and oppression. Whereas a tyrant, as has often

been repeated, has no regard to any public interest, except as conducive to his private ends; his aim is pleasure, the aim of a king, honor. Wherefore also in their desires they differ; the tyrant is desirous of riches, the king, of what brings honor. And the guards of a king are citizens, but of a tyrant mercenaries.

That tyranny has all the vices both of democracy and oligarchy is evident. As of oligarchy so of tyranny, the end is wealth; (for by wealth only can the tyrant maintain either his guard or his luxury). Both mistrust the people, and therefore deprive them of their arms. Both agree too in injuring the people and driving them out of the city and dispersing them. From democracy tyrants have borrowed the art of making war upon the notables and destroying them secretly or openly, or of exiling them because they are rivals and stand in the way of their power; and also because plots against them are contrived by men of this dass, who either want to rule or to escape subjection. Hence Periander advised Thrasybulus by cutting off the tops of the tallest ears of corn, meaning that he must always put out of the way the citizens who overtop the rest. And so, as I have already intimated, the beginnings of change are the same in monarchies as in forms of constitutional government; subjects attack their sovereigns out of fear or contempt, or because they have been unjustly treated by them. And of injustice, the most common form is insult, another is confiscation of property.

The ends sought by conspiracies against monarchies, whether tyrannies or royalties, are the same as the ends sought by conspiracies against other forms of government. Monarchs have great wealth and honor, which are objects of desire to all mankind. The attacks are made sometimes against their lives, sometimes against the office; where the sense of insult is the motive, against their lives. Any sort of insult (and there are many) may stir up anger, and when men are angry, they commonly act out of revenge, and not from ambition. For

example, the attempt made upon the Peisistratidae arose out of the public dishonor offered to the sister of Harmodius and the insult to himself. He attacked the tyrant for his sister's sake, and Aristogeiton joined in the attack for the sake of Harmodius. A conspiracy was also formed against Periander, the tyrant of Ambracia, because, when drinking with a favorite youth, he asked him whether by this time he was not with child by him. Philip, too, was attacked by Pausanias because he permitted him to be insulted by Attalus and his friends, and Amyntas the little, by Derdas, because he boasted of having enjoyed his youth. Evagoras of Cyprus, again, was slain by the eunuch to revenge an insult; for his wife had been carried off by Evagoras's son. Many conspiracies have originated in shameful attempts made by sovereigns on the persons of their subjects. Such was the attack of Crataeas upon Archelaus; he had always hated the connection with him, and so, when Archelaus, having promised him one of his two daughters in marriage, did not give him either of them, but broke his word and married the elder to the king of Elymeia, when he was hard pressed in a war against Sirrhas and Arrhabaeus, and the younger to his own son Amyntas, under the idea that Amyntas would then be less likely to quarrel with his son by Cleopatra – Crataeas made this slight a pretext for attacking Archelaus, though even a less reason would have sufficed, for the real cause of the estrangement was the disgust which he felt at his connection with the king. And from a like motive Hellonocrates of Larissa conspired with him; for when Archelaus, who was his lover, did not fulfill his promise of restoring him to his country, he thought that the connection between them had originated, not in affection, but in the wantonness of power. Pytho, too, and Heracleides of Aenos, slew Cotys in order to avenge their father, and Adamas revolted from Cotys in revenge for the wanton outrage which he had committed in mutilating him when a child.

Many, too, irritated at blows inflicted on the person which they deemed an insult, have either killed or attempted to kill officers of state and royal princes by whom they have been injured. Thus, at Mytilene, Megacles and his friends attacked and slew the Penthilidae, as they were going about and striking people with clubs. At a later date Smerdis, who had been beaten and torn away from his wife by Penthilus, slew him. In the conspiracy against Archelaus, Decamnichus stimulated the fury of the assassins and led the attack; he was enraged because Archelaus had delivered him to Euripides to be scourged; for the poet had been irritated at some remark made by Decamnichus on the foulness of his breath. Many other examples might be cited of murders and conspiracies which have arisen from similar causes.

Fear is another motive which, as we have said, has caused conspiracies as well in monarchies as in more popular forms of government. Thus Artapanes conspired against Xerxes and slew him, fearing that he would be accused of hanging Darius against his orders – he having been under the impression that Xerxes would forget what he had said in the middle of a meal, and that the offense would be forgiven.

Another motive is contempt, as in the case of Sardanapalus, whom some one saw carding wool with his women, if the storytellers say truly; and the tale may be true, if not of him, of some one else. Dion attacked the younger Dionysius because he despised him, and saw that he was equally despised by his own subjects, and that he was always drunk. Even the friends of a tyrant will sometimes attack him out of contempt; for the confidence which he reposes in them breeds contempt, and they think that they will not be found out. The expectation of success is likewise a sort of contempt; the assailants are ready to strike, and think nothing of the danger, because they seem to have the power in their hands. Thus generals of armies attack

monarchs; as, for example, Cyrus attacked Astyages, despising the effeminacy of his life, and believing that his power was worn out. Thus again, Seuthes the Thracian conspired against Amadocus, whose general he was.

And sometimes men are actuated by more than one motive, like Mithridates, who conspired against Ariobarzanes, partly out of contempt and partly from the love of gain.

Bold natures, placed by their sovereigns in a high military position, are most likely to make the attempt in the expectation of success; for courage is emboldened by power, and the union of the two inspires them with the hope of an easy victory.

Attempts of which the motive is ambition arise in a different way as well as in those already mentioned. There are men who will not risk their lives in the hope of gains and honors however great, but who nevertheless regard the killing of a tyrant simply as an extraordinary action which will make them famous and honorable in the world; they wish to acquire, not a kingdom, but a name. It is rare, however, to find such men; he who would kill a tyrant must be prepared to lose his life if he fail. He must have the resolution of Dion, who, when he made war upon Dionysius, took with him very few troops, saying 'that whatever measure of success he might attain would be enough for him, even if he were to die the moment he landed; such a death would be welcome to him.' this is a temper to which few can attain.

Once more, tyrannies, like all other governments, are destroyed from without by some opposite and more powerful form of government. That such a government will have the will to attack them is clear; for the two are opposed in principle; and all men, if they can, do what they will. Democracy is antagonistic to tyranny, on the principle of Hesiod, 'Potter hates Potter,' because they are nearly akin, for the extreme form of democracy is tyranny; and royalty and aristocracy are both alike

opposed to tyranny, because they are constitutions of a different type. And therefore the Lacedaemonians put down most of the tyrannies, and so did the Syracusans during the time when they were well governed.

Again, tyrannies are destroyed from within, when the reigning family are divided among themselves, as that of Gelo was, and more recently that of Dionysius; in the case of Gelo because Thrasybulus, the brother of Hiero, flattered the son of Gelo and led him into excesses in order that he might rule in his name. Whereupon the family got together a party to get rid of Thrasybulus and save the tyranny; but those of the people who conspired with them seized the opportunity and drove them all out. In the case of Dionysius, Dion, his own relative, attacked and expelled him with the assistance of the people; he afterwards perished himself.

There are two chief motives which induce men to attack tyrannies – hatred and contempt. Hatred of tyrants is inevitable, and contempt is also a frequent cause of their destruction. Thus we see that most of those who have acquired, have retained their power, but those who have inherited, have lost it, almost at once; for, living in luxurious ease, they have become contemptible, and offer many opportunities to their assailants. Anger, too, must be included under hatred, and produces the same effects. It is often times even more ready to strike – the angry are more impetuous in making an attack, for they do not follow rational principle. And men are very apt to give way to their passions when they are insulted. To this cause is to be attributed the fall of the Peisistratidae and of many others. Hatred is more reasonable, for anger is accompanied by pain, which is an impediment to reason, whereas hatred is painless.

In a word, all the causes which I have mentioned as destroying the last and most unmixed form of oligarchy, and the extreme

form of democracy, may be assumed to affect tyranny; indeed the extreme forms of both are only tyrannies distributed among several persons. Kingly rule is little affected by external causes, and is therefore lasting; it is generally destroyed from within. And there are two ways in which the destruction may come about; (1) when the members of the royal family quarrel among themselves, and (2) when the kings attempt to administer the state too much after the fashion of a tyranny, and to extend their authority contrary to the law. Royalties do not now come into existence; where such forms of government arise, they are rather monarchies or tyrannies. For the rule of a king is over voluntary subjects, and he is supreme in all important matters; but in our own day men are more upon an equality, and no one is so immeasurably superior to others as to represent adequately the greatness and dignity of the office. Hence mankind will not, if they can help, endure it, and any one who obtains power by force or fraud is at once thought to be a tyrant. In hereditary monarchies a further cause of destruction is the fact that kings often fall into contempt, and, although possessing not tyrannical power, but only royal dignity, are apt to outrage others. Their overthrow is then readily effected; for there is an end to the king when his subjects do not want to have him, but the tyrant lasts, whether they like him or not.

The destruction of monarchies is to be attributed to these and the like causes.

11

And they are preserved, to speak generally, by the opposite causes; or, if we consider them separately, (1) royalty is preserved by the limitation of its powers. The more restricted

the functions of kings, the longer their power will last unimpaired; for then they are more moderate and not so despotic in their ways; and they are less envied by their subjects. This is the reason why the kingly office has lasted so long among the Molossians. And for a similar reason it has continued among the Lacedaemonians, because there it was always divided between two, and afterwards further limited by Theopompus in various respects, more particularly by the establishment of the Ephoralty. He diminished the power of the kings, but established on a more lasting basis the kingly office, which was thus made in a certain sense not less, but greater. There is a story that when his wife once asked him whether he was not ashamed to leave to his sons a royal power which was less than he had inherited from his father, 'No indeed,' he replied, 'for the power which I leave to them will be more lasting.'

As to (2) tyrannies, they are preserved in two most opposite ways. One of them is the old traditional method in which most tyrants administer their government. Of such arts Periander of Corinth is said to have been the great master, and many similar devices may be gathered from the Persians in the administration of their government. There are firstly the prescriptions mentioned some distance back, for the preservation of a tyranny, in so far as this is possible; viz., that the tyrant should lop off those who are too high; he must put to death men of spirit; he must not allow common meals, clubs, education, and the like; he must be upon his guard against anything which is likely to inspire either courage or confidence among his subjects; he must prohibit literary assemblies or other meetings for discussion, and he must take every means to prevent people from knowing one another (for acquaintance begets mutual confidence). Further, he must compel all persons staying in the city to appear in public and live at his gates; then he will know what they are doing: if they are always kept under,

they will learn to be humble. In short, he should practice these and the like Persian and barbaric arts, which all have the same object. A tyrant should also endeavor to know what each of his subjects says or does, and should employ spies, like the 'female detectives' at Syracuse, and the eavesdroppers whom Hiero was in the habit of sending to any place of resort or meeting; for the fear of informers prevents people from speaking their minds, and if they do, they are more easily found out. Another art of the tyrant is to sow quarrels among the citizens; friends should be embroiled with friends, the people with the notables, and the rich with one another. Also he should impoverish his subjects; he thus provides against the maintenance of a guard by the citizen and the people, having to keep hard at work, are prevented from conspiring. The Pyramids of Egypt afford an example of this policy; also the offerings of the family of Cypselus, and the building of the temple of Olympian Zeus by the Peisistratidae, and the great Polycratean monuments at Samos; all these works were alike intended to occupy the people and keep them poor. Another practice of tyrants is to multiply taxes, after the manner of Dionysius at Syracuse, who contrived that within five years his subjects should bring into the treasury their whole property. The tyrant is also fond of making war in order that his subjects may have something to do and be always in want of a leader. And whereas the power of a king is preserved by his friends, the characteristic of a tyrant is to distrust his friends, because he knows that all men want to overthrow him, and they above all have the power.

Again, the evil practices of the last and worst form of democracy are all found in tyrannies. Such are the power given to women in their families in the hope that they will inform against their husbands, and the license which is allowed to slaves in order that they may betray their masters; for slaves and women do not conspire against tyrants; and they are of course friendly to tyrannies and also to democracies, since

under them they have a good time. For the people too would fain be a monarch, and therefore by them, as well as by the tyrant, the flatterer is held in honor; in democracies he is the demagogue; and the tyrant also has those who associate with him in a humble spirit, which is a work of flattery.

Hence tyrants are always fond of bad men, because they love to be flattered, but no man who has the spirit of a freeman in him will lower himself by flattery; good men love others, or at any rate do not flatter them. Moreover, the bad are useful for bad purposes; 'nail knocks out nail,' as the proverb says. It is characteristic of a tyrant to dislike every one who has dignity or independence; he wants to be alone in his glory, but any one who claims a like dignity or asserts his independence encroaches upon his prerogative, and is hated by him as an enemy to his power. Another mark of a tyrant is that he likes foreigners better than citizens, and lives with them and invites them to his table; for the one are enemies, but the Others enter into no rivalry with him.

Such are the notes of the tyrant and the arts by which he preserves his power; there is no wickedness too great for him. All that we have said may be summed up under three heads, which answer to the three aims of the tyrant. These are, (1) the humiliation of his subjects; he knows that a mean-spirited man will not conspire against anybody; (2) the creation of mistrust among them; for a tyrant is not overthrown until men begin to have confidence in one another; and this is the reason why tyrants are at war with the good; they are under the idea that their power is endangered by them, not only because they would not be ruled despotically but also because they are loyal to one another, and to other men, and do not inform against one another or against other men; (3) the tyrant desires that his subjects shall be incapable of action, for no one attempts what is impossible, and they will not attempt to overthrow a tyranny,

if they are powerless. Under these three heads the whole policy of a tyrant may be summed up, and to one or other of them all his ideas may be referred: (1) he sows distrust among his subjects; (2) he takes away their power; (3) he humbles them.

This then is one of the two methods by which tyrannies are preserved; and there is another which proceeds upon an almost opposite principle of action. The nature of this latter method may be gathered from a comparison of the causes which destroy kingdoms, for as one mode of destroying kingly power is to make the office of king more tyrannical, so the salvation of a tyranny is to make it more like the rule of a king. But of one thing the tyrant must be careful; he must keep power enough to rule over his subjects, whether they like him or not, for if he once gives this up he gives up his tyranny. But though power must be retained as the foundation, in all else the tyrant should act or appear to act in the character of a king. In the first place he should pretend a care of the public revenues, and not waste money in making presents of a sort at which the common people get excited when they see their hard-won earnings snatched from them and lavished on courtesans and strangers and artists. He should give an account of what he receives and of what he spends (a practice which has been adopted by some tyrants); for then he will seem to be a steward of the public rather than a tyrant; nor need he fear that, while he is the lord of the city, he will ever be in want of money. Such a policy is at all events much more advantageous for the tyrant when he goes from home, than to leave behind him a hoard, for then the garrison who remain in the city will be less likely to attack his power; and a tyrant, when he is absent from home, has more reason to fear the guardians of his treasure than the citizens, for the one accompany him, but the others remain behind. In the second place, he should be seen to collect taxes and to require public services only for state purposes, and that he may form a fund in case of war, and generally he ought to make

himself the guardian and treasurer of them, as if they belonged, not to him, but to the public. He should appear, not harsh, but dignified, and when men meet him they should look upon him with reverence, and not with fear. Yet it is hard for him to be respected if he inspires no respect, and therefore whatever virtues he may neglect, at least he should maintain the character of a great soldier, and produce the impression that he is one. Neither he nor any of his associates should ever be guilty of the least offense against modesty towards the young of either sex who are his subjects, and the women of his family should observe a like self-control towards other women; the insolence of women has ruined many tyrannies. In the indulgence of pleasures he should be the opposite of our modern tyrants, who not only begin at dawn and pass whole days in sensuality, but want other men to see them, that they may admire their happy and blessed lot. In these things a tyrant should if possible be moderate, or at any rate should not parade his vices to the world; for a drunken and drowsy tyrant is soon despised and attacked; not so he who is temperate and wide awake. His conduct should be the very reverse of nearly everything which has been said before about tyrants. He ought to adorn and improve his city, as though he were not a tyrant, but the guardian of the state. Also he should appear to be particularly earnest in the service of the Gods; for if men think that a ruler is religious and has a reverence for the Gods, they are less afraid of suffering injustice at his hands, and they are less disposed to conspire against him, because they believe him to have the very Gods fighting on his side. At the same time his religion must not be thought foolish. And he should honor men of merit, and make them think that they would not be held in more honor by the citizens if they had a free government. The honor he should distribute himself, but the punishment should be inflicted by officers and courts of law. It is a precaution which is taken by all monarchs not to make one person great; but if one, then two or

more should be raised, that they may look sharply after one another. If after all some one has to be made great, he should not be a man of bold spirit; for such dispositions are ever most inclined to strike. And if any one is to be deprived of his power, let it be diminished gradually, not taken from him all at once. The tyrant should abstain from all outrage; in particular from personal violence and from wanton conduct towards the young. He should be especially careful of his behavior to men who are lovers of honor; for as the lovers of money are offended when their property is touched, so are the lovers of honor and the virtuous when their honor is affected. Therefore a tyrant ought either not to commit such acts at all; or he should be thought only to employ fatherly correction, and not to trample upon others – and his acquaintance with youth should be supposed to arise from affection, and not from the insolence of power, and in general he should compensate the appearance of dishonor by the increase of honor.

Of those who attempt assassination they are the most dangerous, and require to be most carefully watched, who do not care to survive, if they effect their purpose. Therefore special precaution should be taken about any who think that either they or those for whom they care have been insulted; for when men are led away by passion to assault others they are regardless of themselves. As Heracleitus says, 'It is difficult to fight against anger; for a man will buy revenge with his soul.'

And whereas states consist of two classes, of poor men and of rich, the tyrant should lead both to imagine that they are preserved and prevented from harming one another by his rule, and whichever of the two is stronger he should attach to his government; for, having this advantage, he has no need either to emancipate slaves or to disarm the citizens; either party added to the force which he already has, will make him stronger than his assailants.

But enough of these details; what should be the general policy of the tyrant is obvious. He ought to show himself to his subjects in the light, not of a tyrant, but of a steward and a king. He should not appropriate what is theirs, but should be their guardian; he should be moderate, not extravagant in his way of life; he should win the notables by companionship, and the multitude by flattery. For then his rule will of necessity be nobler and happier, because he will rule over better men whose spirits are not crushed, over men to whom he himself is not an object of hatred, and of whom he is not afraid. His power too will be more lasting. His disposition will be virtuous, or at least half virtuous; and he will not be wicked, but half wicked only.

12

Yet no forms of government are so short-lived as oligarchy and tyranny. The tyranny which lasted longest was that of Orthagoras and his sons at Sicyon; this continued for a hundred years. The reason was that they treated their subjects with moderation, and to a great extent observed the laws; and in various ways gained the favor of the people by the care which they took of them. Cleisthenes, in particular, was respected for his military ability. If report may be believed, he crowned the judge who decided against him in the games; and, as some say, the sitting statue in the Agora of Sicyon is the likeness of this person. (A similar story is told of Peisistratus, who is said on one occasion to have allowed himself to be summoned and tried before the Areopagus.)

Next in duration to the tyranny of Orthagoras was that of the Cypselidae at Corinth, which lasted seventy-three years and six months: Cypselus reigned thirty years, Periander forty and a

half, and Psammetichus the son of Gorgus three. Their continuance was due to similar causes: Cypselus was a popular man, who during the whole time of his rule never had a bodyguard; and Periander, although he was a tyrant, was a great soldier. Third in duration was the rule of the Peisistratidae at Athens, but it was interrupted; for Peisistratus was twice driven out, so that during three and thirty years he reigned only seventeen; and his sons reigned eighteen – altogether thirty-five years. Of other tyrannies, that of Hiero and Gelo at Syracuse was the most lasting. Even this, however, was short, not more than eighteen years in all; for Gelo continued tyrant for seven years, and died in the eighth; Hiero reigned for ten years, and Thrasybulus was driven out in the eleventh month. In fact, tyrannies generally have been of quite short duration.

I have now gone through almost all the causes by which constitutional governments and monarchies are either destroyed or preserved.

In the Republic of Plato, Socrates treats of revolutions, but not well, for he mentions no cause of change which peculiarly affects the first, or perfect state. He only says that the cause is that nothing is abiding, but all things change in a certain cycle; and that the origin of the change consists in those numbers 'of which 4 and 3, married with 5, furnish two harmonies' (he means when the number of this figure becomes solid); he conceives that nature at certain times produces bad men who will not submit to education; in which latter particular he may very likely be not far wrong, for there may well be some men who cannot be educated and made virtuous. But why is such a cause of change peculiar to his ideal state, and not rather common to all states, nay, to everything which comes into being at all? And is it by the agency of time, which, as he declares, makes all things change, that things which did not begin together, change together? For example, if something has come

into being the day before the completion of the cycle, will it change with things that came into being before? Further, why should the perfect state change into the Spartan? For governments more often take an opposite form than one akin to them. The same remark is applicable to the other changes; he says that the Spartan constitution changes into an oligarchy, and this into a democracy, and this again into a tyranny. And yet the contrary happens quite as often; for a democracy is even more likely to change into an oligarchy than into a monarchy. Further, he never says whether tyranny is, or is not, liable to revolutions, and if it is, what is the cause of them, or into what form it changes. And the reason is, that he could not very well have told: for there is no rule; according to him it should revert to the first and best, and then there would be a complete cycle. But in point of fact a tyranny often changes into a tyranny, as that at Sicyon changed from the tyranny of Myron into that of Cleisthenes; into oligarchy, as the tyranny of Antileon did at Chalcis; into democracy, as that of Gelo's family did at Syracuse; into aristocracy, as at Carthage, and the tyranny of Charilaus at Lacedaemon. Often an oligarchy changes into a tyranny, like most of the ancient oligarchies in Sicily; for example, the oligarchy at Leontini changed into the tyranny of Panaetius; that at Gela into the tyranny of Cleander; that at Rhegium into the tyranny of Anaxilaus; the same thing has happened in many other states. And it is absurd to suppose that the state changes into oligarchy merely because the ruling class are lovers and makers of money, and not because the very rich think it unfair that the very poor should have an equal share in the government with themselves. Moreover, in many oligarchies there are laws against making money in trade. But at Carthage, which is a democracy. there is no such prohibition; and yet to this day the Carthaginians have never had a revolution. It is absurd too for him to say that an oligarchy is two cities, one of the rich, and the other of the poor. Is not this just as much the

case in the Spartan constitution, or in any other in which either all do not possess equal property, or all are not equally good men? Nobody need be any poorer than he was before, and yet the oligarchy may change an the same into a democracy, if the poor form the majority; and a democracy may change into an oligarchy, if the wealthy class are stronger than the people, and the one are energetic, the other indifferent. Once more, although the causes of the change are very numerous, he mentions only one, which is, that the citizens become poor through dissipation and debt, as though he thought that all, or the majority of them, were originally rich. This is not true: though it is true that when any of the leaders lose their property they are ripe for revolution; but, when anybody else, it is no great matter, and an oligarchy does not even then more often pass into a democracy than into any other form of government. Again, if men are deprived of the honors of state, and are wronged, and insulted, they make revolutions, and change forms of government, even although they have not wasted their substance because they might do what they liked – of which extravagance he declares excessive freedom to be the cause.

Finally, although there are many forms of oligarchies and democracies, Socrates speaks of their revolutions as though there were only one form of either of them.

Book VI

1

We have now considered the varieties of the deliberative or supreme power in states, and the various arrangements of law-courts and state offices, and which of them are adapted to different forms of government. We have also spoken of the destruction and preservation of constitutions, how and from what causes they arise.

Of democracy and all other forms of government there are many kinds; and it will be well to assign to them severally the modes of organization which are proper and advantageous to each, adding what remains to be said about them. Moreover, we ought to consider the various combinations of these modes themselves; for such combinations make constitutions overlap one another, so that aristocracies have an oligarchical character, and constitutional governments incline to democracies.

When I speak of the combinations which remain to be considered, and thus far have not been considered by us, I mean such as these: when the deliberative part of the government and the election of officers is constituted oligarchically, and the law-courts aristocratically, or when the courts and the deliberative part of the state are oligarchical, and the election to office aristocratical, or when in any other way there is a want of harmony in the composition of a state.

I have shown already what forms of democracy are suited to particular cities, and what of oligarchy to particular peoples, and to whom each of the other forms of government is suited. Further, we must not only show which of these governments is

the best for each state, but also briefly proceed to consider how these and other forms of government are to be established.

First of all let us speak of democracy, which will also bring to light the opposite form of government commonly called oligarchy. For the purposes of this inquiry we need to ascertain all the elements and characteristics of democracy, since from the combinations of these the varieties of democratic government arise. There are several of these differing from each other, and the difference is due to two causes. One (1) has been already mentioned – differences of population; for the popular element may consist of husbandmen, or of mechanics, or of laborers, and if the first of these be added to the second, or the third to the two others, not only does the democracy become better or worse, but its very nature is changed. A second cause (2) remains to be mentioned: the various properties and characteristics of democracy, when variously combined, make a difference. For one democracy will have less and another will have more, and another will have all of these characteristics. There is an advantage in knowing them all, whether a man wishes to establish some new form of democracy, or only to remodel an existing one. Founders of states try to bring together all the elements which accord with the ideas of the several constitutions; but this is a mistake of theirs, as I have already remarked when speaking of the destruction and preservation of states. We will now set forth the principles, characteristics, and aims of such states.

2

The basis of a democratic state is liberty; which, according to the common opinion of men, can only be enjoyed in such a

state; this they affirm to be the great end of every democracy. One principle of liberty is for all to rule and be ruled in turn, and indeed democratic justice is the application of numerical not proportionate equality; whence it follows that the majority must be supreme, and that whatever the majority approve must be the end and the just. Every citizen, it is said, must have equality, and therefore in a democracy the poor have more power than the rich, because there are more of them, and the will of the majority is supreme. This, then, is one note of liberty which all democrats affirm to be the principle of their state. Another is that a man should live as he likes. This, they say, is the privilege of a freeman, since, on the other hand, not to live as a man likes is the mark of a slave. This is the second characteristic of democracy, whence has arisen the claim of men to be ruled by none, if possible, or, if this is impossible, to rule and be ruled in turns; and so it contributes to the freedom based upon equality.

Such being our foundation and such the principle from which we start, the characteristics of democracy are as follows the election of officers by all out of all; and that all should rule over each, and each in his turn over all; that the appointment to all offices, or to all but those which require experience and skill, should be made by lot; that no property qualification should be required for offices, or only a very low one; that a man should not hold the same office twice, or not often, or in the case of few except military offices: that the tenure of all offices, or of as many as possible, should be brief, that all men should sit in judgment, or that judges selected out of all should judge, in all matters, or in most and in the greatest and most important – such as the scrutiny of accounts, the constitution, and private contracts; that the assembly should be supreme over all causes, or at any rate over the most important, and the magistrates over none or only over a very few. Of all magistracies, a council is the most democratic when there is not the means of paying all the

citizens, but when they are paid even this is robbed of its power; for the people then draw all cases to themselves, as I said in the previous discussion. The next characteristic of democracy is payment for services; assembly, law courts, magistrates, everybody receives pay, when it is to be had; or when it is not to be had for all, then it is given to the law-courts and to the stated assemblies, to the council and to the magistrates, or at least to any of them who are compelled to have their meals together. And whereas oligarchy is characterized by birth, wealth, and education, the notes of democracy appear to be the opposite of these – low birth, poverty, mean employment. Another note is that no magistracy is perpetual, but if any such have survived some ancient change in the constitution it should be stripped of its power, and the holders should be elected by lot and no longer by vote. These are the points common to all democracies; but democracy and demos in their truest form are based upon the recognized principle of democratic justice, that all should count equally; for equality implies that the poor should have no more share in the government than the rich, and should not be the only rulers, but that all should rule equally according to their numbers. And in this way men think that they will secure equality and freedom in their state.

3

Next comes the question, how is this equality to be obtained? Are we to assign to a thousand poor men the property qualifications of five hundred rich men? and shall we give the thousand a power equal to that of the five hundred? or, if this is not to be the mode, ought we, still retaining the same ratio, to take equal numbers from each and give them the control of the elections and of the courts? – Which, according to the

democratical notion, is the juster form of the constitution – this or one based on numbers only? Democrats say that justice is that to which the majority agree, oligarchs that to which the wealthier class; in their opinion the decision should be given according to the amount of property. In both principles there is some inequality and injustice. For if justice is the will of the few, any one person who has more wealth than all the rest of the rich put together, ought, upon the oligarchical principle, to have the sole power – but this would be tyranny; or if justice is the will of the majority, as I was before saying, they will unjustly confiscate the property of the wealthy minority. To find a principle of equality which they both agree we must inquire into their respective ideas of justice.

Now they agree in saying that whatever is decided by the majority of the citizens is to be deemed law. Granted: but not without some reserve; since there are two classes out of which a state is composed – the poor and the rich – that is to be deemed law, on which both or the greater part of both agree; and if they disagree, that which is approved by the greater number, and by those who have the higher qualification. For example, suppose that there are ten rich and twenty poor, and some measure is approved by six of the rich and is disapproved by fifteen of the poor, and the remaining four of the rich join with the party of the poor, and the remaining five of the poor with that of the rich; in such a case the will of those whose qualifications, when both sides are added up, are the greatest, should prevail. If they turn out to be equal, there is no greater difficulty than at present, when, if the assembly or the courts are divided, recourse is had to the lot, or to some similar expedient. But, although it may be difficult in theory to know what is just and equal, the practical difficulty of inducing those to forbear who can, if they like, encroach, is far greater, for the weaker are always asking for equality and justice, but the stronger care for none of these things.

4

Of the four kinds of democracy, as was said in the in the previous discussion, the best is that which comes first in order; it is also the oldest of them all. I am speaking of them according to the natural classification of their inhabitants. For the best material of democracy is an agricultural population; there is no difficulty in forming a democracy where the mass of the people live by agriculture or tending of cattle. Being poor, they have no leisure, and therefore do not often attend the assembly, and not having the necessaries of life they are always at work, and do not covet the property of others. Indeed, they find their employment pleasanter than the cares of government or office where no great gains can be made out of them, for the many are more desirous of gain than of honor. A proof is that even the ancient tyrannies were patiently endured by them, as they still endure oligarchies, if they are allowed to work and are not deprived of their property; for some of them grow quickly rich and the others are well enough off. Moreover, they have the power of electing the magistrates and calling them to account; their ambition, if they have any, is thus satisfied; and in some democracies, although they do not all share in the appointment of offices, except through representatives elected in turn out of the whole people, as at Mantinea; yet, if they have the power of deliberating, the many are contented. Even this form of government may be regarded as a democracy, and was such at Mantinea. Hence it is both expedient and customary in the aforementioned type of democracy that all should elect to offices, and conduct scrutinies, and sit in the law-courts, but that the great offices should be filled up by election and from persons having a qualification; the greater requiring a greater

qualification, or, if there be no offices for which a qualification is required, then those who are marked out by special ability should be appointed. Under such a form of government the citizens are sure to be governed well (for the offices will always be held by the best persons; the people are willing enough to elect them and are not jealous of the good). The good and the notables will then be satisfied, for they will not be governed by men who are their inferiors, and the persons elected will rule justly, because others will call them to account. Every man should be responsible to others, nor should any one be allowed to do just as he pleases; for where absolute freedom is allowed, there is nothing to restrain the evil which is inherent in every man. But the principle of responsibility secures that which is the greatest good in states; the right persons rule and are prevented from doing wrong, and the people have their due. It is evident that this is the best kind of democracy, and why? Because the people are drawn from a certain class. Some of the ancient laws of most states were, all of them, useful with a view to making the people husbandmen. They provided either that no one should possess more than a certain quantity of land, or that, if he did, the land should not be within a certain distance from the town or the acropolis. Formerly in many states there was a law forbidding any one to sell his original allotment of land. There is a similar law attributed to Oxylus, which is to the effect that there should be a certain portion of every man's land on which he could not borrow money. A useful corrective to the evil of which I am speaking would be the law of the Aphytaeans, who, although they are numerous, and do not possess much land, are all of them husbandmen. For their properties are reckoned in the census; not entire, but only in such small portions that even the poor may have more than the amount required.

Next best to an agricultural, and in many respects similar, are a pastoral people, who live by their flocks; they are the best

trained of any for war, robust in body and able to camp out. The people of whom other democracies consist are far inferior to them, for their life is inferior; there is no room for moral excellence in any of their employments, whether they be mechanics or traders or laborers. Besides, people of this class can readily come to the assembly, because they are continually moving about in the city and in the agora; whereas husbandmen are scattered over the country and do not meet, or equally feel the want of assembling together. Where the territory also happens to extend to a distance from the city, there is no difficulty in making an excellent democracy or constitutional government; for the people are compelled to settle in the country, and even if there is a town population the assembly ought not to meet, in democracies, when the country people cannot come. We have thus explained how the first and best form of democracy should be constituted; it is clear that the other or inferior sorts will deviate in a regular order, and the population which is excluded will at each stage be of a lower kind.

The last form of democracy, that in which all share alike, is one which cannot be borne by all states, and will not last long unless well regulated by laws and customs. The more general causes which tend to destroy this or other kinds of government have been pretty fully considered. In order to constitute such a democracy and strengthen the people, the leaders have been in the habit including as many as they can, and making citizens not only of those who are legitimate, but even of the illegitimate, and of those who have only one parent a citizen, whether father or mother; for nothing of this sort comes amiss to such a democracy. This is the way in which demagogues proceed. Whereas the right thing would be to make no more additions when the number of the commonalty exceeds that of the notables and of the middle class – beyond this not to go. When in excess of this point, the constitution becomes

disorderly, and the notables grow excited and impatient of the democracy, as in the insurrection at Cyrene; for no notice is taken of a little evil, but when it increases it strikes the eye. Measures like those which Cleisthenes passed when he wanted to increase the power of the democracy at Athens, or such as were taken by the founders of popular government at Cyrene, are useful in the extreme form of democracy. Fresh tribes and brotherhoods should be established; the private rites of families should be restricted and converted into public ones; in short, every contrivance should be adopted which will mingle the citizens with one another and get rid of old connections. Again, the measures which are taken by tyrants appear all of them to be democratic; such, for instance, as the license permitted to slaves (which may be to a certain extent advantageous) and also that of women and children, and the aflowing everybody to live as he likes. Such a government will have many supporters, for most persons would rather live in a disorderly than in a sober manner.

5

The mere establishment of a democracy is not the only or principal business of the legislator, or of those who wish to create such a state, for any state, however badly constituted, may last one, two, or three days; a far greater difficulty is the preservation of it. The legislator should therefore endeavor to have a firm foundation according to the principles already laid down concerning the preservation and destruction of states; he should guard against the destructive elements, and should make laws, whether written or unwritten, which will contain all the preservatives of states. He must not think the truly democratical or oligarchical measure to be that which will give

the greatest amount of democracy or oligarchy, but that which will make them last longest. The demagogues of our own day often get property confiscated in the law-courts in order to please the people. But those who have the welfare of the state at heart should counteract them, and make a law that the property of the condemned should not be public and go into the treasury but be sacred. Thus offenders will be as much afraid, for they will be punished all the same, and the people, having nothing to gain, will not be so ready to condemn the accused. Care should also be taken that state trials are as few as possible, and heavy penalties should be inflicted on those who bring groundless accusations; for it is the practice to indict, not members of the popular party, but the notables, although the citizens ought to be all attached to the constitution as well, or at any rate should not regard their rulers as enemies.

Now, since in the last and worst form of democracy the citizens are very numerous, and can hardly be made to assemble unless they are paid, and to pay them when there are no revenues presses hardly upon the notables (for the money must be obtained by a property tax and confiscations and corrupt practices of the courts, things which have before now overthrown many democracies); where, I say, there are no revenues, the government should hold few assemblies, and the law-courts should consist of many persons, but sit for a few days only. This system has two advantages: first, the rich do not fear the expense, even although they are unpaid themselves when the poor are paid; and secondly, causes are better tried, for wealthy persons, although they do not like to be long absent from their own affairs, do not mind going for a few days to the law-courts. Where there are revenues the demagogues should not be allowed after their manner to distribute the surplus; the poor are always receiving and always wanting more and more, for such help is like water poured into a leaky cask. Yet the true friend of the people should see that they be not too poor, for

extreme poverty lowers the character of the democracy; measures therefore should be taken which will give them lasting prosperity; and as this is equally the interest of all classes, the proceeds of the public revenues should be accumulated and distributed among its poor, if possible, in such quantities as may enable them to purchase a little farm, or, at any rate, make a beginning in trade or husbandry. And if this benevolence cannot be extended to all, money should be distributed in turn according to tribes or other divisions, and in the meantime the rich should pay the fee for the attendance of the poor at the necessary assemblies; and should in return be excused from useless public services. By administering the state in this spirit the Carthaginians retain the affections of the people; their policy is from time to time to send some of them into their dependent towns, where they grow rich. It is also worthy of a generous and sensible nobility to divide the poor amongst them, and give them the means of going to work. The example of the people of Tarentum is also well deserving of imitation, for, by sharing the use of their own property with the poor, they gain their good will. Moreover, they divide all their offices into two classes, some of them being elected by vote, the others by lot; the latter, that the people may participate in them, and the former, that the state may be better administered. A like result may be gained by dividing the same offices, so as to have two classes of magistrates, one chosen by vote, the other by lot.

Enough has been said of the manner in which democracies ought to be constituted.

6

From these considerations there will be no difficulty in seeing what should be the constitution of oligarchies. We have only to reason from opposites and compare each form of oligarchy with the corresponding form of democracy.

The first and best attempered of oligarchies is akin to a constitutional government. In this there ought to be two standards of qualification; the one high, the other low – the lower qualifying for the humbler yet indispensable offices and the higher for the superior ones. He who acquires the prescribed qualification should have the rights of citizenship. The number of those admitted should be such as will make the entire governing body stronger than those who are excluded, and the new citizen should be always taken out of the better class of the people. The principle, narrowed a little, gives another form of oligarchy; until at length we reach the most cliquish and tyrannical of them all, answering to the extreme democracy, which, being the worst, requires vigilance in proportion to its badness. For as healthy bodies and ships well provided with sailors may undergo many mishaps and survive them, whereas sickly constitutions and rotten ill-manned ships are ruined by the very least mistake, so do the worst forms of government require the greatest care. The populousness of democracies generally preserves them (for e state need not be much increased,since there is no necessity tha number is to democracy in the place of justice based on proportion); whereas the preservation of an oligarchy clearly depends on an opposite principle, viz., good order.

7

As there are four chief divisions of the common people – husbandmen, mechanics, retail traders, laborers; so also there are four kinds of military forces – the cavalry, the heavy infantry, the light armed troops, the navy. When the country is adapted for cavalry, then a strong oligarchy is likely to be established. For the security of the inhabitants depends upon a force of this sort, and only rich men can afford to keep horses. The second form of oligarchy prevails when the country is adapted to heavy infantry; for this service is better suited to the rich than to the poor. But the light-armed and the naval element are wholly democratic; and nowadays, where they are numerous, if the two parties quarrel, the oligarchy are often worsted by them in the struggle. A remedy for this state of things may be found in the practice of generals who combine a proper contingent of light-armed troops with cavalry and heavy-armed. And this is the way in which the poor get the better of the rich in civil contests; being lightly armed, they fight with advantage against cavalry and heavy being lightly armed, they fight with advantage against cavalry and heavy infantry. An oligarchy which raises such a force out of the lower classes raises a power against itself. And therefore, since the ages of the citizens vary and some are older and some younger, the fathers should have their own sons, while they are still young, taught the agile movements of light-armed troops; and these, when they have been taken out of the ranks of the youth, should become light-armed warriors in reality. The oligarchy should also yield a share in the government to the people, either, as I said before, to those who have a property qualification, or, as in the case of Thebes, to those who have abstained for a certain number of years from mean employments, or, as at Massalia, to men of merit who are selected for their worthiness, whether previously citizens or not. The magistracies of the highest rank, which ought to be in the hands of the governing body, should have

expensive duties attached to them, and then the people will not desire them and will take no offense at the privileges of their rulers when they see that they pay a heavy fine for their dignity. It is fitting also that the magistrates on entering office should offer magnificent sacrifices or erect some public edifice, and then the people who participate in the entertainments, and see the city decorated with votive offerings and buildings, will not desire an alteration in the government, and the notables will have memorials of their munificence. This, however, is anything but the fashion of our modern oligarchs, who are as covetous of gain as they are of honor; oligarchies like theirs may be well described as petty democracies. Enough of the manner in which democracies and oligarchies should be organized.

8

Next in order follows the right distribution of offices, their number, their nature, their duties, of which indeed we have already spoken. No state can exist not having the necessary offices, and no state can be well administered not having the offices which tend to preserve harmony and good order. In small states, as we have already remarked, there must not be many of them, but in larger there must be a larger number, and we should carefully consider which offices may properly be united and which separated.

First among necessary offices is that which has the care of the market; a magistrate should be appointed to inspect contracts and to maintain order. For in every state there must inevitably be buyers and sellers who will supply one another's wants; this is the readiest way to make a state self-sufficing and so fulfill the purpose for which men come together into one state. A

second office of a similar kind undertakes the supervision and embellishment of public and private buildings, the maintaining and repairing of houses and roads, the prevention of disputes about boundaries, and other concerns of a like nature. This is commonly called the office of City Warden, and has various departments, which, in more populous towns, are shared among different persons, one, for example, taking charge of the walls, another of the fountains, a third of harbors. There is another equally necessary office, and of a similar kind, having to do with the same matters without the walls and in the country – the magistrates who hold this office are called Wardens of the country, or Inspectors of the woods. Besides these three there is a fourth office of receivers of taxes, who have under their charge the revenue which is distributed among the various departments; these are called Receivers or Treasurers. Another officer registers all private contracts, and decisions of the courts, all public indictments, and also all preliminary proceedings. This office again is sometimes subdivided, in which case one officer is appointed over all the rest. These officers are called Recorders or Sacred Recorders, Presidents, and the like.

Next to these comes an office of which the duties are the most necessary and also the most difficult, viz., that to which is committed the execution of punishments, or the exaction of fines from those who are posted up according to the registers; and also the custody of prisoners. The difficulty of this office arises out of the odium which is attached to it; no one will undertake it unless great profits are to be made, and any one who does is loath to execute the law. Still the office is necessary; for judicial decisions are useless if they take no effect; and if society cannot exist without them, neither can it exist without the execution of them. It is an office which, being so unpopular, should not be entrusted to one person, but divided among several taken from different courts. In like

manner an effort should be made to distribute among different persons the writing up of those who are on the register of public debtors. Some sentences should be executed by the magistrates also, and in particular penalties due to the outgoing magistrates should be exacted by the incoming ones; and as regards those due to magistrates already in office, when one court has given judgement, another should exact the penalty; for example, the wardens of the city should exact the fines imposed by the wardens of the agora, and others again should exact the fines imposed by them. For penalties are more likely to be exacted when less odium attaches to the exaction of them; but a double odium is incurred when the judges who have passed also execute the sentence, and if they are always the executioners, they will be the enemies of all.

In many places, while one magistracy executes the sentence, another has the custody of the prisoners, as, for example, 'the Eleven' at Athens. It is well to separate off the jailorship also, and try by some device to render the office less unpopular. For it is quite as necessary as that of the executioners; but good men do all they can to avoid it, and worthless persons cannot safely be trusted with it; for they themselves require a guard, and are not fit to guard others. There ought not therefore to be a single or permanent officer set apart for this duty; but it should be entrusted to the young, wherever they are organized into a band or guard, and different magistrates acting in turn should take charge of it.

These are the indispensable officers, and should be ranked first; next in order follow others, equally necessary, but of higher rank, and requiring great experience and fidelity. Such are the officers to which are committed the guard of the city, and other military functions. Not only in time of war but of peace their duty will be to defend the walls and gates, and to muster and marshal the citizens. In some states there are many such

offices; in others there are a few only, while small states are content with one; these officers are called generals or commanders. Again, if a state has cavalry or light-armed troops or archers or a naval force, it will sometimes happen that each of these departments has separate officers, who are called admirals, or generals of cavalry or of light-armed troops. And there are subordinate officers called naval captains, and captains of light-armed troops and of horse; having others under them: all these are included in the department of war. Thus much of military command.

But since many, not to say all, of these offices handle the public money, there must of necessity be another office which examines and audits them, and has no other functions. Such officers are called by various names – Scrutineers, Auditors, Accountants, Controllers. Besides all these offices there is another which is supreme over them, and to this is often entrusted both the introduction and the ratification of measures, or at all events it presides, in a democracy, over the assembly. For there must be a body which convenes the supreme authority in the state. In some places they are called 'probuli,' because they hold previous deliberations, but in a democracy more commonly 'councillors.' These are the chief political offices.

Another set of officers is concerned with the maintenance of religion priests and guardians see to the preservation and repair of the temples of the Gods and to other matters of religion. One office of this sort may be enough in small places, but in larger ones there are a great many besides the priesthood; for example, superintendents of public worship, guardians of shrines, treasurers of the sacred revenues. Nearly connected with these there are also the officers appointed for the performance of the public sacrifices, except any which the law assigns to the priests; such sacrifices derive their dignity from

the public hearth of the city. They are sometimes called archons, sometimes kings, and sometimes prytanes.

These, then, are the necessary offices, which may be summed up as follows: offices concerned with matters of religion, with war, with the revenue and expenditure, with the market, with the city, with the harbors, with the country; also with the courts of law, with the records of contracts, with execution of sentences, with custody of prisoners, with audits and scrutinies and accounts of magistrates; lastly, there are those which preside over the public deliberations of the state. There are likewise magistracies characteristic of states which are peaceful and prosperous, and at the same time have a regard to good order: such as the offices of guardians of women, guardians of the law, guardians of children, and directors of gymnastics; also superintendents of gymnastic and Dionysiac contests, and of other similar spectacles. Some of these are clearly not democratic offices; for example, the guardianships of women and children – the poor, not having any slaves, must employ both their women and children as servants.

Once more: there are three offices according to whose directions the highest magistrates are chosen in certain states – guardians of the law, probuli, councillors – of these, the guardians of the law are an aristocratical, the probuli an oligarchical, the council a democratical institution. Enough of the different kinds of offices.

Book VII

1

He who would duly inquire about the best form of a state ought first to determine which is the most eligible life; while this remains uncertain the best form of the state must also be uncertain; for, in the natural order of things, those may be expected to lead the best life who are governed in the best manner of which their circumstances admit. We ought therefore to ascertain, first of all, which is the most generally eligible life, and then whether the same life is or is not best for the state and for individuals.

Assuming that enough has been already said in discussions outside the school concerning the best life, we will now only repeat what is contained in them. Certainly no one will dispute the propriety of that partition of goods which separates them into three classes, viz., external goods, goods of the body, and goods of the soul, or deny that the happy man must have all three. For no one would maintain that he is happy who has not in him a particle of courage or temperance or justice or prudence, who is afraid of every insect which flutters past him, and will commit any crime, however great, in order to gratify his lust of meat or drink, who will sacrifice his dearest friend for the sake of half-a-farthing, and is as feeble and false in mind as a child or a madman. These propositions are almost universally acknowledged as soon as they are uttered, but men differ about the degree or relative superiority of this or that good. Some think that a very moderate amount of virtue is enough, but set no limit to their desires of wealth, property, power, reputation, and the like. To whom we reply by an appeal to facts, which

easily prove that mankind do not acquire or preserve virtue by the help of external goods, but external goods by the help of virtue, and that happiness, whether consisting in pleasure or virtue, or both, is more often found with those who are most highly cultivated in their mind and in their character, and have only a moderate share of external goods, than among those who possess external goods to a useless extent but are deficient in higher qualities; and this is not only matter of experience, but, if reflected upon, will easily appear to be in accordance with reason. For, whereas external goods have a limit, like any other instrument, and all things useful are of such a nature that where there is too much of them they must either do harm, or at any rate be of no use, to their possessors, every good of the soul, the greater it is, is also of greater use, if the epithet useful as well as noble is appropriate to such subjects. No proof is required to show that the best state of one thing in relation to another corresponds in degree of excellence to the interval between the natures of which we say that these very states are states: so that, if the soul is more noble than our possessions or our bodies, both absolutely and in relation to us, it must be admitted that the best state of either has a similar ratio to the other. Again, it is for the sake of the soul that goods external and goods of the body are eligible at all, and all wise men ought to choose them for the sake of the soul, and not the soul for the sake of them.

Let us acknowledge then that each one has just so much of happiness as he has of virtue and wisdom, and of virtuous and wise action. God is a witness to us of this truth, for he is happy and blessed, not by reason of any external good, but in himself and by reason of his own nature. And herein of necessity lies the difference between good fortune and happiness; for external goods come of themselves, and chance is the author of them, but no one is just or temperate by or through chance. In like manner, and by a similar train of argument, the happy state

may be shown to be that which is best and which acts rightly; and rightly it cannot act without doing right actions, and neither individual nor state can do right actions without virtue and wisdom. Thus the courage, justice, and wisdom of a state have the same form and nature as the qualities which give the individual who possesses them the name of just, wise, or temperate.

Thus much may suffice by way of preface: for I could not avoid touching upon these questions, neither could I go through all the arguments affecting them; these are the business of another science.

Let us assume then that the best life, both for individuals and states, is the life of virtue, when virtue has external goods enough for the performance of good actions. If there are any who controvert our assertion, we will in this treatise pass them over, and consider their objections hereafter.

2

There remains to be discussed the question whether the happiness of the individual is the same as that of the state, or different. Here again there can be no doubt – no one denies that they are the same. For those who hold that the well-being of the individual consists in his wealth, also think that riches make the happiness of the whole state, and those who value most highly the life of a tyrant deem that city the happiest which rules over the greatest number; while they who approve an individual for his virtue say that the more virtuous a city is, the happier it is. Two points here present themselves for consideration: first (1), which is the more eligible life, that of a citizen who is a member of a state, or that of an alien who has

no political ties; and again (2), which is the best form of constitution or the best condition of a state, either on the supposition that political privileges are desirable for all, or for a majority only? Since the good of the state and not of the individual is the proper subject of political thought and speculation, and we are engaged in a political discussion, while the first of these two points has a secondary interest for us, the latter will be the main subject of our inquiry.

Now it is evident that the form of government is best in which every man, whoever he is, can act best and live happily. But even those who agree in thinking that the life of virtue is the most eligible raise a question, whether the life of business and politics is or is not more eligible than one which is wholly independent of external goods, I mean than a contemplative life, which by some is maintained to be the only one worthy of a philosopher. For these two lives – the life of the philosopher and the life of the statesman – appear to have been preferred by those who have been most keen in the pursuit of virtue, both in our own and in other ages. Which is the better is a question of no small moment; for the wise man, like the wise state, will necessarily regulate his life according to the best end. There are some who think that while a despotic rule over others is the greatest injustice, to exercise a constitutional rule over them, even though not unjust, is a great impediment to a man's individual wellbeing. Others take an opposite view; they maintain that the true life of man is the practical and political, and that every virtue admits of being practiced, quite as much by statesmen and rulers as by private individuals. Others, again, are of opinion that arbitrary and tyrannical rule alone consists with happiness; indeed, in some states the entire aim both of the laws and of the constitution is to give men despotic power over their neighbors. And, therefore, although in most cities the laws may be said generally to be in a chaotic state, still, if they aim at anything, they aim at the maintenance of power: thus in

Lacedaemon and Crete the system of education and the greater part of the of the laws are framed with a view to war. And in all nations which are able to gratify their ambition military power is held in esteem, for example among the Scythians and Persians and Thracians and Celts.

In some nations there are even laws tending to stimulate the warlike virtues, as at Carthage, where we are told that men obtain the honor of wearing as many armlets as they have served campaigns. There was once a law in Macedonia that he who had not killed an enemy should wear a halter, and among the Scythians no one who had not slain his man was allowed to drink out of the cup which was handed round at a certain feast. Among the Iberians, a warlike nation, the number of enemies whom a man has slain is indicated by the number of obelisks which are fixed in the earth round his tomb; and there are numerous practices among other nations of a like kind, some of them established by law and others by custom. Yet to a reflecting mind it must appear very strange that the statesman should be always considering how he can dominate and tyrannize over others, whether they will or not. How can that which is not even lawful be the business of the statesman or the legislator? Unlawful it certainly is to rule without regard to justice, for there may be might where there is no right. The other arts and sciences offer no parallel a physician is not expected to persuade or coerce his patients, nor a pilot the passengers in his ship. Yet most men appear to think that the art of despotic government is statesmanship, and what men affirm to be unjust and inexpedient in their own case they are not ashamed of practicing towards others; they demand just rule for themselves, but where other men are concerned they care nothing about it. Such behavior is irrational; unless the one party is, and the other is not, born to serve, in which case men have a right to command, not indeed all their fellows, but only those who are intended to be subjects; just as we ought not to

hunt mankind, whether for food or sacrifice, but only the animals which may be hunted for food or sacrifice, this is to say, such wild animals as are eatable. And surely there may be a city happy in isolation, which we will assume to be well-governed (for it is quite possible that a city thus isolated might be well-administered and have good laws); but such a city would not be constituted with any view to war or the conquest of enemies – all that sort of thing must be excluded. Hence we see very plainly that warlike pursuits, although generally to be deemed honorable, are not the supreme end of all things, but only means. And the good lawgiver should inquire how states and races of men and communities may participate in a good life, and in the happiness which is attainable by them. His enactments will not be always the same; and where there are neighbors he will have to see what sort of studies should be practiced in relation to their several characters, or how the measures appropriate in relation to each are to be adopted. The end at which the best form of government should aim may be properly made a matter of future consideration.

3

Let us now address those who, while they agree that the life of virtue is the most eligible, differ about the manner of practicing it. For some renounce political power, and think that the life of the freeman is different from the life of the statesman and the best of all; but others think the life of the statesman best. The argument of the latter is that he who does nothing cannot do well, and that virtuous activity is identical with happiness. To both we say: 'you are partly right and partly wrong.' first class are right in affirming that the life of the freeman is better than the life of the despot; for there is nothing grand or noble in

having the use of a slave, in so far as he is a slave; or in issuing commands about necessary things. But it is an error to suppose that every sort of rule is despotic like that of a master over slaves, for there is as great a difference between the rule over freemen and the rule over slaves as there is between slavery by nature and freedom by nature, about which I have said enough at the commencement of this treatise. And it is equally a mistake to place inactivity above action, for happiness is activity, and the actions of the just and wise are the realization of much that is noble.

But perhaps some one, accepting these premises, may still maintain that supreme power is the best of all things, because the possessors of it are able to perform the greatest number of noble actions. if so, the man who is able to rule, instead of giving up anything to his neighbor, ought rather to take away his power; and the father should make no account of his son, nor the son of his father, nor friend of friend; they should not bestow a thought on one another in comparison with this higher object, for the best is the most eligible and 'doing eligible' and 'doing well' is the best. There might be some truth in such a view if we assume that robbers and plunderers attain the chief good. But this can never be; their hypothesis is false. For the actions of a ruler cannot really be honorable, unless he is as much superior to other men as a husband is to a wife, or a father to his children, or a master to his slaves. And therefore he who violates the law can never recover by any success, however great, what he has already lost in departing from virtue. For equals the honorable and the just consist in sharing alike, as is just and equal. But that the unequal should be given to equals, and the unlike to those who are like, is contrary to nature, and nothing which is contrary to nature is good. If, therefore, there is any one superior in virtue and in the power of performing the best actions, him we ought to follow and obey, but he must have the capacity for action as well as virtue.

If we are right in our view, and happiness is assumed to be virtuous activity, the active life will be the best, both for every city collectively, and for individuals. Not that a life of action must necessarily have relation to others, as some persons think, nor are those ideas only to be regarded as practical which are pursued for the sake of practical results, but much more the thoughts and contemplations which are independent and complete in themselves; since virtuous activity, and therefore a certain kind of action, is an end, and even in the case of external actions the directing mind is most truly said to act. Neither, again, is it necessary that states which are cut off from others and choose to live alone should be inactive; for activity, as well as other things, may take place by sections; there are many ways in which the sections of a state act upon one another. The same thing is equally true of every individual. If this were otherwise, God and the universe, who have no external actions over and above their own energies, would be far enough from perfection. Hence it is evident that the same life is best for each individual, and for states and for mankind collectively

4

Thus far by way of introduction. In what has preceded I have discussed other forms of government; in what remains the first point to be considered is what should be the conditions of the ideal or perfect state; for the perfect state cannot exist without a due supply of the means of life. And therefore we must presuppose many purely imaginary conditions, but nothing impossible. There will be a certain number of citizens, a country in which to place them, and the like. As the weaver or shipbuilder or any other artisan must have the material proper

for his work (and in proportion as this is better prepared, so will the result of his art be nobler), so the statesman or legislator must also have the materials suited to him.

First among the materials required by the statesman is population: he will consider what should be the number and character of the citizens, and then what should be the size and character of the country. Most persons think that a state in order to be happy ought to be large; but even if they are right, they have no idea what is a large and what a small state. For they judge of the size of the city by the number of the inhabitants; whereas they ought to regard, not their number, but their power. A city too, like an individual, has a work to do; and that city which is best adapted to the fulfillment of its work is to be deemed greatest, in the same sense of the word great in which Hippocrates might be called greater, not as a man, but as a physician, than some one else who was taller And even if we reckon greatness by numbers, we ought not to include everybody, for there must always be in cities a multitude of slaves and sojourners and foreigners; but we should include those only who are members of the state, and who form an essential part of it. The number of the latter is a proof of the greatness of a city; but a city which produces numerous artisans and comparatively few soldiers cannot be great, for a great city is not to be confounded with a populous one. Moreover, experience shows that a very populous city can rarely, if ever, be well governed; since all cities which have a reputation for good government have a limit of population. We may argue on grounds of reason, and the same result will follow. For law is order, and good law is good order; but a very great multitude cannot be orderly: to introduce order into the unlimited is the work of a divine power – of such a power as holds together the universe. Beauty is realized in number and magnitude, and the state which combines magnitude with good order must necessarily be the most beautiful. To the size of states there is a

limit, as there is to other things, plants, animals, implements; for none of these retain their natural power when they are too large or too small, but they either wholly lose their nature, or are spoiled. For example, a ship which is only a span long will not be a ship at all, nor a ship a quarter of a mile long; yet there may be a ship of a certain size, either too large or too small, which will still be a ship, but bad for sailing. In like manner a state when composed of too few is not, as a state ought to be, self-sufficing; when of too many, though self-sufficing in all mere necessaries, as a nation may be, it is not a state, being almost incapable of constitutional government. For who can be the general of such a vast multitude, or who the herald, unless he have the voice of a Stentor?

A state, then, only begins to exist when it has attained a population sufficient for a good life in the political community: it may indeed, if it somewhat exceed this number, be a greater state. But, as I was saying, there must be a limit. What should be the limit will be easily ascertained by experience. For both governors and governed have duties to perform; the special functions of a governor to command and to judge. But if the citizens of a state are to judge and to distribute offices according to merit, then they must know each other's characters; where they do not possess this knowledge, both the election to offices and the decision of lawsuits will go wrong. When the population is very large they are manifestly settled at haphazard, which clearly ought not to be. Besides, in an over-populous state foreigners and metics will readily acquire the rights of citizens, for who will find them out? Clearly then the best limit of the population of a state is the largest number which suffices for the purposes of life, and can be taken in at a single view. Enough concerning the size of a state.

5

Much the same principle will apply to the territory of the state: every one would agree in praising the territory which is most entirely self-sufficing; and that must be the territory which is all-producing, for to have all things and to want nothing is sufficiency. In size and extent it should be such as may enable the inhabitants to live at once temperately and liberally in the enjoyment of leisure. Whether we are right or wrong in laying down this limit we will inquire more precisely hereafter, when we have occasion to consider what is the right use of property and wealth: a matter which is much disputed, because men are inclined to rush into one of two extremes, some into meanness, others into luxury.

It is not difficult to determine the general character of the territory which is required (there are, however, some points on which military authorities should be heard); it should be difficult of access to the enemy, and easy of egress to the inhabitants. Further, we require that the land as well as the inhabitants of whom we were just now speaking should be taken in at a single view, for a country which is easily seen can be easily protected. As to the position of the city, if we could have what we wish, it should be well situated in regard both to sea and land. This then is one principle, that it should be a convenient center for the protection of the whole country: the other is, that it should be suitable for receiving the fruits of the soil, and also for the bringing in of timber and any other products that are easily transported.

6

Whether a communication with the sea is beneficial to a well-ordered state or not is a question which has often been asked. It is argued that the introduction of strangers brought up under other laws, and the increase of population, will be adverse to good order; the increase arises from their using the sea and having a crowd of merchants coming and going, and is inimical to good government. Apart from these considerations, it would be undoubtedly better, both with a view to safety and to the provision of necessaries, that the city and territory should be connected with the sea; the defenders of a country, if they are to maintain themselves against an enemy, should be easily relieved both by land and by sea; and even if they are not able to attack by sea and land at once, they will have less difficulty in doing mischief to their assailants on one element, if they themselves can use both. Moreover, it is necessary that they should import from abroad what is not found in their own country, and that they should export what they have in excess; for a city ought to be a market, not indeed for others, but for herself.

Those who make themselves a market for the world only do so for the sake of revenue, and if a state ought not to desire profit of this kind it ought not to have such an emporium. Nowadays we often see in countries and cities dockyards and harbors very conveniently placed outside the city, but not too far off; and they are kept in dependence by walls and similar fortifications. Cities thus situated manifestly reap the benefit of intercourse with their ports; and any harm which is likely to accrue may be easily guarded against by the laws, which will pronounce and determine who may hold communication with one another, and who may not.

There can be no doubt that the possession of a moderate naval force is advantageous to a city; the city should be formidable not only to its own citizens but to some of its neighbors, or, if necessary, able to assist them by sea as well as by land. The proper number or magnitude of this naval force is relative to the character of the state; for if her function is to take a leading part in politics, her naval power should be commensurate with the scale of her enterprises. The population of the state need not be much increased, since there is no necessity that the sailors should be citizens: the marines who have the control and command will be freemen, and belong also to the infantry; and wherever there is a dense population of Perioeci and husbandmen, there will always be sailors more than enough. Of this we see instances at the present day. The city of Heraclea, for example, although small in comparison with many others, can man a considerable fleet. Such are our conclusions respecting the territory of the state, its harbors, its towns, its relations to the sea, and its maritime power.

7

Having spoken of the number of the citizens, we will proceed to speak of what should be their character. This is a subject which can be easily understood by any one who casts his eye on the more celebrated states of Hellas, and generally on the distribution of races in the habitable world. Those who live in a cold climate and in Europe are full of spirit, but wanting in intelligence and skill; and therefore they retain comparative freedom, but have no political organization, and are incapable of ruling over others. Whereas the natives of Asia are intelligent and inventive, but they are wanting in spirit, and therefore they are always in a state of subjection and slavery. But the Hellenic

race, which is situated between them, is likewise intermediate in character, being high-spirited and also intelligent. Hence it continues free, and is the best-governed of any nation, and, if it could be formed into one state, would be able to rule the world. There are also similar differences in the different tribes of Hellas; for some of them are of a one-sided nature, and are intelligent or courageous only, while in others there is a happy combination of both qualities. And clearly those whom the legislator will most easily lead to virtue may be expected to be both intelligent and courageous. Some say that the guardians should be friendly towards those whom they know, fierce towards those whom they do not know. Now, passion is the quality of the soul which begets friendship and enables us to love; notably the spirit within us is more stirred against our friends and acquaintances than against those who are unknown to us, when we think that we are despised by them; for which reason Archilochus, complaining of his friends, very naturally addresses his soul in these words:

For surely thou art plagued on account of friends.

The power of command and the love of freedom are in all men based upon this quality, for passion is commanding and invincible. Nor is it right to say that the guardians should be fierce towards those whom they do not know, for we ought not to be out of temper with any one; and a lofty spirit is not fierce by nature, but only when excited against evil-doers. And this, as I was saying before, is a feeling which men show most strongly towards their friends if they think they have received a wrong at their hands: as indeed is reasonable; for, besides the actual injury, they seem to be deprived of a benefit by those who owe them one. Hence the saying:

Cruel is the strife of brethren,

and again:

They who love in excess also hate in excess.

Thus we have nearly determined the number and character of the citizens of our state, and also the size and nature of their territory. I say 'nearly,' for we ought not to require the same minuteness in theory as in the facts given by perception.

8

As in other natural compounds the conditions of a composite whole are not necessarily organic parts of it, so in a state or in any other combination forming a unity not everything is a part, which is a necessary condition. The members of an association have necessarily some one thing the same and common to all, in which they share equally or unequally for example, food or land or any other thing. But where there are two things of which one is a means and the other an end, they have nothing in common except that the one receives what the other produces. Such, for example, is the relation which workmen and tools stand to their work; the house and the builder have nothing in common, but the art of the builder is for the sake of the house. And so states require property, but property, even though living beings are included in it, is no part of a state; for a state is not a community of living beings only, but a community of equals, aiming at the best life possible. Now, whereas happiness is the highest good, being a realization and perfect practice of virtue, which some can attain, while others have little or none of it, the various qualities of men are clearly the reason why there are various kinds of states and many forms of government; for different men seek after happiness in different ways and by different means, and so make for themselves different modes of life and forms of government. We must see also how many

things are indispensable to the existence of a state, for what we call the parts of a state will be found among the indispensables. Let us then enumerate the functions of a state, and we shall easily elicit what we want:

First, there must be food; secondly, arts, for life requires many instruments; thirdly, there must be arms, for the members of a community have need of them, and in their own hands, too, in order to maintain authority both against disobedient subjects and against external assailants; fourthly, there must be a certain amount of revenue, both for internal needs, and for the purposes of war; fifthly, or rather first, there must be a care of religion which is commonly called worship; sixthly, and most necessary of all there must be a power of deciding what is for the public interest, and what is just in men's dealings with one another.

These are the services which every state may be said to need. For a state is not a mere aggregate of persons, but a union of them sufficing for the purposes of life; and if any of these things be wanting, it is as we maintain impossible that the community can be absolutely self-sufficing. A state then should be framed with a view to the fulfillment of these functions. There must be husbandmen to procure food, and artisans, and a warlike and a wealthy class, and priests, and judges to decide what is necessary and expedient.

9

Having determined these points, we have in the next place to consider whether all ought to share in every sort of occupation. Shall every man be at once husbandman, artisan, councillor, judge, or shall we suppose the several occupations just

mentioned assigned to different persons? or, thirdly, shall some employments be assigned to individuals and others common to all? The same arrangement, however, does not occur in every constitution; as we were saying, all may be shared by all, or not all by all, but only by some; and hence arise the differences of constitutions, for in democracies all share in all, in oligarchies the opposite practice prevails. Now, since we are here speaking of the best form of government, i.e., that under which the state will be most happy (and happiness, as has been already said, cannot exist without virtue), it clearly follows that in the state which is best governed and possesses men who are just absolutely, and not merely relatively to the principle of the constitution, the citizens must not lead the life of mechanics or tradesmen, for such a life is ignoble, and inimical to virtue. Neither must they be husbandmen, since leisure is necessary both for the development of virtue and the performance of political duties.

Again, there is in a state a class of warriors, and another of councillors, who advise about the expedient and determine matters of law, and these seem in an especial manner parts of a state. Now, should these two classes be distinguished, or are both functions to be assigned to the same persons? Here again there is no difficulty in seeing that both functions will in one way belong to the same, in another, to different persons. To different persons in so far as these i.e., the physical and the employments are suited to different primes of life, for the one requires mental wisdom and the other strength. But on the other hand, since it is an impossible thing that those who are able to use or to resist force should be willing to remain always in subjection, from this point of view the persons are the same; for those who carry arms can always determine the fate of the constitution. It remains therefore that both functions should be entrusted by the ideal constitution to the same persons, not, however, at the same time, but in the order prescribed by

nature, who has given to young men strength and to older men wisdom. Such a distribution of duties will be expedient and also just, and is founded upon a principle of conformity to merit. Besides, the ruling class should be the owners of property, for they are citizens, and the citizens of a state should be in good circumstances; whereas mechanics or any other class which is not a producer of virtue have no share in the state. This follows from our first principle, for happiness cannot exist without virtue, and a city is not to be termed happy in regard to a portion of the citizens, but in regard to them all. And clearly property should be in their hands, since the husbandmen will of necessity be slaves or barbarian Perioeci.

Of the classes enumerated there remain only the priests, and the manner in which their office is to be regulated is obvious. No husbandman or mechanic should be appointed to it; for the Gods should receive honor from the citizens only. Now since the body of the citizen is divided into two classes, the warriors and the councillors and it is beseeming that the worship of the Gods should be duly performed, and also a rest provided in their service for those who from age have given up active life, to the old men of these two classes should be assigned the duties of the priesthood.

We have shown what are the necessary conditions, and what the parts of a state: husbandmen, craftsmen, and laborers of an kinds are necessary to the existence of states, but the parts of the state are the warriors and councillors. And these are distinguished severally from one another, the distinction being in some cases permanent, in others not.

10

It is not a new or recent discovery of political philosophers that the state ought to be divided into classes, and that the warriors should be separated from the husbandmen. The system has continued in Egypt and in Crete to this day, and was established, as tradition says, by a law of Sesostris in Egypt and of Minos in Crete. The institution of common tables also appears to be of ancient date, being in Crete as old as the reign of Minos, and in Italy far older. The Italian historians say that there was a certain Italus, king of Oenotria, from whom the Oenotrians were called Italians, and who gave the name of Italy to the promontory of Europe lying within the Scylletic and Lametic Gulfs, which are distant from one another only half a day's journey. They say that this Italus converted the Oenotrians from shepherds into husbandmen, and besides other laws which he gave them, was the founder of their common meals; even in our day some who are derived from him retain this institution and certain other laws of his. On the side of Italy towards Tyrrhenia dwelt the Opici, who are now, as of old, called Ausones; and on the side towards Iapygia and the Ionian Gulf, in the district called Siritis, the Chones, who are likewise of Oenotrian race. From this part of the world originally came the institution of common tables; the separation into castes from Egypt, for the reign of Sesostris is of far greater antiquity than that of Minos. It is true indeed that these and many other things have been invented several times over in the course of ages, or rather times without number; for necessity may be supposed to have taught men the inventions which were absolutely required, and when these were provided, it was natural that other things which would adorn and enrich life should grow up by degrees. And we may

infer that in political institutions the same rule holds. Egypt witnesses to the antiquity of all these things, for the Egyptians appear to be of all people the most ancient; and they have laws and a regular constitution existing from time immemorial. We should therefore make the best use of what has been already discovered, and try to supply defects.

I have already remarked that the land ought to belong to those who possess arms and have a share in the government, and that the husbandmen ought to be a class distinct from them; and I have determined what should be the extent and nature of the territory. Let me proceed to discuss the distribution of the land, and the character of the agricultural class; for I do not think that property ought to be common, as some maintain, but only that by friendly consent there should be a common use of it; and that no citizen should be in want of subsistence.

As to common meals, there is a general agreement that a well ordered city should have them; and we will hereafter explain what are our own reasons for taking this view. They ought, however, to be open to all the citizens. And yet it is not easy for the poor to contribute the requisite sum out of their private means, and to provide also for their household. The expense of religious worship should likewise be a public charge. The land must therefore be divided into two parts, one public and the other private, and each part should be subdivided, part of the public land being appropriated to the service of the Gods, and the other part used to defray the cost of the common meals; while of the private land, part should be near the border, and the other near the city, so that, each citizen having two lots, they may all of them have land in both places; there is justice and fairness in such a division, and it tends to inspire unanimity among the people in their border wars. Where there is not this arrangement some of them are too ready to come to blows with their neighbors, while others are so cautious that

they quite lose the sense of honor. Wherefore there is a law in some places which forbids those who dwell near the border to take part in public deliberations about wars with neighbors, on the ground that their interests will pervert their judgment. For the reasons already mentioned, then, the land should be divided in the manner described. The very best thing of all would be that the husbandmen should be slaves taken from among men who are not all of the same race and not spirited, for if they have no spirit they will be better suited for their work, and there will be no danger of their making a revolution. The next best thing would be that they should be Perioeci of foreign race, and of a like inferior nature; some of them should be the slaves of individuals, and employed in the private estates of men of property, the remainder should be the property of the state and employed on the common land. I will hereafter explain what is the proper treatment of slaves, and why it is expedient that liberty should be always held out to them as the reward of their services.

11

We have already said that the city should be open to the land and to the sea, and to the whole country as far as possible. In respect of the place itself our wish would be that its situation should be fortunate in four things. The first, health – this is a necessity: cities which lie towards the east, and are blown upon by winds coming from the east, are the healthiest; next in healthfulness are those which are sheltered from the north wind, for they have a milder winter. The site of the city should likewise be convenient both for political administration and for war. With a view to the latter it should afford easy egress to the citizens, and at the same time be inaccessible and difficult of

capture to enemies. There should be a natural abundance of springs and fountains in the town, or, if there is a deficiency of them, great reservoirs may be established for the collection of rainwater, such as will not fail when the inhabitants are cut off from the country by by war. Special care should be taken of the health of the inhabitants, which will depend chiefly on the healthiness of the locality and of the quarter to which they are exposed, and secondly, on the use of pure water; this latter point is by no means a secondary consideration. For the elements which we use most and oftenest for the support of the body contribute most to health, and among these are water and air. Wherefore, in all wise states, if there is a want of pure water, and the supply is not all equally good, the drinking water ought to be separated from that which is used for other purposes.

As to strongholds, what is suitable to different forms of government varies: thus an acropolis is suited to an oligarchy or a monarchy, but a plain to a democracy; neither to an aristocracy, but rather a number of strong places. The arrangement of private houses is considered to be more agreeable and generally more convenient, if the streets are regularly laid out after the modern fashion which Hippodamus introduced, but for security in war the antiquated mode of building, which made it difficult for strangers to get out of a town and for assailants to find their way in, is preferable. A city should therefore adopt both plans of building: it is possible to arrange the houses irregularly, as husbandmen plant their vines in what are called 'clumps.' The whole town should not be laid out in straight lines, but only certain quarters and regions; thus security and beauty will be combined.

As to walls, those who say that cities making any pretension to military virtue should not have them, are quite out of date in their notions; and they may see the cities which prided themselves on this fancy confuted by facts. True, there is little

courage shown in seeking for safety behind a rampart when an enemy is similar in character and not much superior in number; but the superiority of the besiegers may be and often is too much both for ordinary human valor and for that which is found only in a few; and if they are to be saved and to escape defeat and outrage, the strongest wall will be the truest soldierly precaution, more especially now that missiles and siege engines have been brought to such perfection. To have no walls would be as foolish as to choose a site for a town in an exposed country, and to level the heights; or as if an individual were to leave his house unwalled, lest the inmates should become cowards. Nor must we forget that those who have their cities surrounded by walls may either take advantage of them or not, but cities which are unwalled have no choice.

If our conclusions are just, not only should cities have walls, but care should be taken to make them ornamental, as well as useful for warlike purposes, and adapted to resist modern inventions. For as the assailants of a city do all they can to gain an advantage, so the defenders should make use of any means of defense which have been already discovered, and should devise and invent others, for when men are well prepared no enemy even thinks of attacking them.

12

As the walls are to be divided by guardhouses and towers built at suitable intervals, and the body of citizens must be distributed at common tables, the idea will naturally occur that we should establish some of the common tables in the guardhouses. These might be arranged as has been suggested; while the principal common tables of the magistrates will

occupy a suitable place, and there also will be the buildings appropriated to religious worship except in the case of those rites which the law or the Pythian oracle has restricted to a special locality. The site should be a spot seen far and wide, which gives due elevation to virtue and towers over the neighborhood. Below this spot should be established an agora, such as that which the Thessalians call the 'freemen's agora'; from this all trade should be excluded, and no mechanic, husbandman, or any such person allowed to enter, unless he be summoned by the magistrates. It would be a charming use of the place, if the gymnastic exercises of the elder men were performed there. For in this noble practice different ages should be separated, and some of the magistrates should stay with the boys, while the grown-up men remain with the magistrates; for the presence of the magistrates is the best mode of inspiring true modesty and ingenuous fear. There should also be a traders' agora, distinct and apart from the other, in a situation which is convenient for the reception of goods both by sea and land.

But in speaking of the magistrates we must not forget another section of the citizens, viz., the priests, for whom public tables should likewise be provided in their proper place near the temples. The magistrates who deal with contracts, indictments, summonses, and the like, and those who have the care of the agora and of the city, respectively, ought to be established near an agora and some public place of meeting; the neighborhood of the traders' agora will be a suitable spot; the upper agora we devote to the life of leisure, the other is intended for the necessities of trade.

The same order should prevail in the country, for there too the magistrates, called by some 'Inspectors of Forests' and by others 'Wardens of the Country,' must have guardhouses and common tables while they are on duty; temples should also be scattered

throughout the country, dedicated, some to Gods, and some to heroes.

But it would be a waste of time for us to linger over details like these. The difficulty is not in imagining but in carrying them out. We may talk about them as much as we like, but the execution of them will depend upon fortune. Wherefore let us say no more about these matters for the present.

13

Returning to the constitution itself, let us seek to determine out of what and what sort of elements the state which is to be happy and well-governed should be composed. There are two things in which all which all well-being consists: one of them is the choice of a right end and aim of action, and the other the discovery of the actions which are means towards it; for the means and the end may agree or disagree. Sometimes the right end is set before men, but in practice they fail to attain it; in other cases they are successful in all the means, but they propose to themselves a bad end; and sometimes they fail in both. Take, for example, the art of medicine; physicians do not always understand the nature of health, and also the means which they use may not effect the desired end. In all arts and sciences both the end and the means should be equally within our control.

The happiness and well-being which all men manifestly desire, some have the power of attaining, but to others, from some accident or defect of nature, the attainment of them is not granted; for a good life requires a supply of external goods, in a less degree when men are in a good state, in a greater degree when they are in a lower state. Others again, who possess the

conditions of happiness, go utterly wrong from the first in the pursuit of it. But since our object is to discover the best form of government, that, namely, under which a city will be best governed, and since the city is best governed which has the greatest opportunity of obtaining happiness, it is evident that we must clearly ascertain the nature of happiness.

We maintain, and have said in the Ethics, if the arguments there adduced are of any value, that happiness is the realization and perfect exercise of virtue, and this not conditional, but absolute. And I used the term 'conditional' to express that which is indispensable, and 'absolute' to express that which is good in itself. Take the case of just actions; just punishments and chastisements do indeed spring from a good principle, but they are good only because we cannot do without them – it would be better that neither individuals nor states should need anything of the sort – but actions which aim at honor and advantage are absolutely the best. The conditional action is only the choice of a lesser evil; whereas these are the foundation and creation of good. A good man may make the best even of poverty and disease, and the other ills of life; but he can only attain happiness under the opposite conditions (for this also has been determined in accordance with ethical arguments, that the good man is he for whom, because he is virtuous, the things that are absolutely good are good; it is also plain that his use of these goods must be virtuous and in the absolute sense good). This makes men fancy that external goods are the cause of happiness, yet we might as well say that a brilliant performance on the lyre was to be attributed to the instrument and not to the skill of the performer.

It follows then from what has been said that some things the legislator must find ready to his hand in a state, others he must provide. And therefore we can only say: May our state be constituted in such a manner as to be blessed with the goods of

which fortune disposes (for we acknowledge her power): whereas virtue and goodness in the state are not a matter of chance but the result of knowledge and purpose. A city can be virtuous only when the citizens who have a share in the government are virtuous, and in our state all the citizens share in the government; let us then inquire how a man becomes virtuous. For even if we could suppose the citizen body to be virtuous, without each of them being so, yet the latter would be better, for in the virtue of each the virtue of all is involved.

There are three things which make men good and virtuous; these are nature, habit, rational principle. In the first place, every one must be born a man and not some other animal; so, too, he must have a certain character, both of body and soul. But some qualities there is no use in having at birth, for they are altered by habit, and there are some gifts which by nature are made to be turned by habit to good or bad. Animals lead for the most part a life of nature, although in lesser particulars some are influenced by habit as well. Man has rational principle, in addition, and man only. Wherefore nature, habit, rational principle must be in harmony with one another; for they do not always agree; men do many things against habit and nature, if rational principle persuades them that they ought. We have already determined what natures are likely to be most easily molded by the hands of the legislator. An else is the work of education; we learn some things by habit and some by instruction.

14

Since every political society is composed of rulers and subjects let us consider whether the relations of one to the other should

interchange or be permanent. For the education of the citizens will necessarily vary with the answer given to this question. Now, if some men excelled others in the same degree in which gods and heroes are supposed to excel mankind in general (having in the first place a great advantage even in their bodies, and secondly in their minds), so that the superiority of the governors was undisputed and patent to their subjects, it would clearly be better that once for an the one class should rule and the other serve. But since this is unattainable, and kings have no marked superiority over their subjects, such as Scylax affirms to be found among the Indians, it is obviously necessary on many grounds that all the citizens alike should take their turn of governing and being governed. Equality consists in the same treatment of similar persons, and no government can stand which is not founded upon justice. For if the government be unjust every one in the country unites with the governed in the desire to have a revolution, and it is an impossibility that the members of the government can be so numerous as to be stronger than all their enemies put together. Yet that governors should excel their subjects is undeniable. How all this is to be effected, and in what way they will respectively share in the government, the legislator has to consider. The subject has been already mentioned. Nature herself has provided the distinction when she made a difference between old and young within the same species, of whom she fitted the one to govern and the other to be governed. No one takes offense at being governed when he is young, nor does he think himself better than his governors, especially if he will enjoy the same privilege when he reaches the required age.

We conclude that from one point of view governors and governed are identical, and from another different. And therefore their education must be the same and also different. For he who would learn to command well must, as men say, first of all learn to obey. As I observed in the first part of this

treatise, there is one rule which is for the sake of the rulers and another rule which is for the sake of the ruled; the former is a despotic, the latter a free government. Some commands differ not in the thing commanded, but in the intention with which they are imposed. Wherefore, many apparently menial offices are an honor to the free youth by whom they are performed; for actions do not differ as honorable or dishonorable in themselves so much as in the end and intention of them. But since we say that the virtue of the citizen and ruler is the same as that of the good man, and that the same person must first be a subject and then a ruler, the legislator has to see that they become good men, and by what means this may be accomplished, and what is the end of the perfect life.

Now the soul of man is divided into two parts, one of which has a rational principle in itself, and the other, not having a rational principle in itself, is able to obey such a principle. And we call a man in any way good because he has the virtues of these two parts. In which of them the end is more likely to be found is no matter of doubt to those who adopt our division; for in the world both of nature and of art the inferior always exists for the sake of the better or superior, and the better or superior is that which has a rational principle. This principle, too, in our ordinary way of speaking, is divided into two kinds, for there is a practical and a speculative principle. This part, then, must evidently be similarly divided. And there must be a corresponding division of actions; the actions of the naturally better part are to be preferred by those who have it in their power to attain to two out of the three or to all, for that is always to every one the most eligible which is the highest attainable by him. The whole of life is further divided into two parts, business and leisure, war and peace, and of actions some aim at what is necessary and useful, and some at what is honorable. And the preference given to one or the other class of actions must necessarily be like the preference given to one or

other part of the soul and its actions over the other; there must be war for the sake of peace, business for the sake of leisure, things useful and necessary for the sake of things honorable. All these points the statesman should keep in view when he frames his laws; he should consider the parts of the soul and their functions, and above all the better and the end; he should also remember the diversities of human lives and actions. For men must be able to engage in business and go to war, but leisure and peace are better; they must do what is necessary and indeed what is useful, but what is honorable is better. On such principles children and persons of every age which requires education should be trained. Whereas even the Hellenes of the present day who are reputed to be best governed, and the legislators who gave them their constitutions, do not appear to have framed their governments with a regard to the best end, or to have given them laws and education with a view to all the virtues, but in a vulgar spirit have fallen back on those which promised to be more useful and profitable. Many modern writers have taken a similar view: they commend the Lacedaemonian constitution, and praise the legislator for making conquest and war his sole aim, a doctrine which may be refuted by argument and has long ago been refuted by facts. For most men desire empire in the hope of accumulating the goods of fortune; and on this ground Thibron and all those who have written about the Lacedaemonian constitution have praised their legislator, because the Lacedaemonians, by being trained to meet dangers, gained great power. But surely they are not a happy people now that their empire has passed away, nor was their legislator right. How ridiculous is the result, if, when they are continuing in the observance of his laws and no one interferes with them, they have lost the better part of life! These writers further err about the sort of government which the legislator should approve, for the government of freemen is nobler and implies more virtue than despotic government.

Neither is a city to be deemed happy or a legislator to be praised because he trains his citizens to conquer and obtain dominion over their neighbors, for there is great evil in this. On a similar principle any citizen who could, should obviously try to obtain the power in his own state – the crime which the Lacedaemonians accuse king Pausanias of attempting, although he had so great honor already. No such principle and no law having this object is either statesmanlike or useful or right. For the same things are best both for individuals and for states, and these are the things which the legislator ought to implant in the minds of his citizens.

Neither should men study war with a view to the enslavement of those who do not deserve to be enslaved; but first of all they should provide against their own enslavement, and in the second place obtain empire for the good of the governed, and not for the sake of exercising a general despotism, and in the third place they should seek to be masters only over those who deserve to be slaves. Facts, as well as arguments, prove that the legislator should direct all his military and other measures to the provision of leisure and the establishment of peace. For most of these military states are safe only while they are at war, but fall when they have acquired their empire; like unused iron they lose their temper in time of peace. And for this the legislator is to blame, he never having taught them how to lead the life of peace.

15

Since the end of individuals and of states is the same, the end of the best man and of the best constitution must also be the same; it is therefore evident that there ought to exist in both of

them the virtues of leisure; for peace, as has been often repeated, is the end of war, and leisure of toil. But leisure and cultivation may be promoted, not only by those virtues which are practiced in leisure, but also by some of those which are useful to business. For many necessaries of life have to be supplied before we can have leisure. Therefore a city must be temperate and brave, and able to endure: for truly, as the proverb says, 'There is no leisure for slaves,' and those who cannot face danger like men are the slaves of any invader. Courage and endurance are required for business and philosophy for leisure, temperance and justice for both, and more especially in times of peace and leisure, for war compels men to be just and temperate, whereas the enjoyment of good fortune and the leisure which comes with peace tend to make them insolent. Those then who seem to be the best-off and to be in the possession of every good, have special need of justice and temperance – for example, those (if such there be, as the poets say) who dwell in the Islands of the Blest; they above all will need philosophy and temperance and justice, and all the more the more leisure they have, living in the midst of abundance. There is no difficulty in seeing why the state that would be happy and good ought to have these virtues. If it be disgraceful in men not to be able to use the goods of life, it is peculiarly disgraceful not to be able to use them in time of leisure – to show excellent qualities in action and war, and when they have peace and leisure to be no better than slaves. Wherefore we should not practice virtue after the manner of the Lacedaemonians. For they, while agreeing with other men in their conception of the highest goods, differ from the rest of mankind in thinking that they are to be obtained by the practice of a single virtue. And since they think these goods and the enjoyment of them greater than the enjoyment derived from the virtues ... and that it should be practiced for its own sake, is

evident from what has been said; we must now consider how and by what means it is to be attained.

We have already determined that nature and habit and rational principle are required, and, of these, the proper nature of the citizens has also been defined by us. But we have still to consider whether the training of early life is to be that of rational principle or habit, for these two must accord, and when in accord they will then form the best of harmonies. The rational principle may be mistaken and fail in attaining the highest ideal of life, and there may be a like evil influence of habit. Thus much is clear in the first place, that, as in all other things, birth implies an antecedent beginning, and that there are beginnings whose end is relative to a further end. Now, in men rational principle and mind are the end towards which nature strives, so that the birth and moral discipline of the citizens ought to be ordered with a view to them. In the second place, as the soul and body are two, we see also that there are two parts of the soul, the rational and the irrational, and two corresponding states – reason and appetite. And as the body is prior in order of generation to the soul, so the irrational is prior to the rational. The proof is that anger and wishing and desire are implanted in children from their very birth, but reason and understanding are developed as they grow older. Wherefore, the care of the body ought to precede that of the soul, and the training of the appetitive part should follow: none the less our care of it must be for the sake of the reason, and our care of the body for the sake of the soul.

16

Since the legislator should begin by considering how the frames of the children whom he is rearing may be as good as possible, his first care will be about marriage – at what age should his citizens marry, and who are fit to marry? In legislating on this subject he ought to consider the persons and the length of their life, that their procreative life may terminate at the same period, and that they may not differ in their bodily powers, as will be the case if the man is still able to beget children while the woman is unable to bear them, or the woman able to bear while the man is unable to beget, for from these causes arise quarrels and differences between married persons. Secondly, he must consider the time at which the children will succeed to their parents; there ought not to be too great an interval of age, for then the parents will be too old to derive any pleasure from their affection, or to be of any use to them. Nor ought they to be too nearly of an age; to youthful marriages there are many objections – the children will be wanting in respect to the parents, who will seem to be their contemporaries, and disputes will arise in the management of the household. Thirdly, and this is the point from which we digressed, the legislator must mold to his will the frames of newly-born children. Almost all these objects may be secured by attention to one point. Since the time of generation is commonly limited within the age of seventy years in the case of a man, and of fifty in the case of a woman, the commencement of the union should conform to these periods. The union of male and female when too young is bad for the procreation of children; in all other animals the offspring of the young are small and in-developed, and with a tendency to produce female children, and therefore also in man, as is proved by the fact that in those cities in which men and women are accustomed to marry young, the people are small and weak; in childbirth also younger women suffer more, and more of them die; some persons say that this was the meaning of the

response once given to the Troezenians – the oracle really meant that many died because they married too young; it had nothing to do with the ingathering of the harvest. It also conduces to temperance not to marry too soon; for women who marry early are apt to be wanton; and in men too the bodily frame is stunted if they marry while the seed is growing (for there is a time when the growth of the seed, also, ceases, or continues to but a slight extent). Women should marry when they are about eighteen years of age, and men at seven and thirty; then they are in the prime of life, and the decline in the powers of both will coincide. Further, the children, if their birth takes place soon, as may reasonably be expected, will succeed in the beginning of their prime, when the fathers are already in the decline of life, and have nearly reached their term of three-score years and ten.

Thus much of the age proper for marriage: the season of the year should also be considered; according to our present custom, people generally limit marriage to the season of winter, and they are right. The precepts of physicians and natural philosophers about generation should also be studied by the parents themselves; the physicians give good advice about the favorable conditions of the body, and the natural philosophers about the winds; of which they prefer the north to the south.

What constitution in the parent is most advantageous to the offspring is a subject which we will consider more carefully when we speak of the education of children, and we will only make a few general remarks at present. The constitution of an athlete is not suited to the life of a citizen, or to health, or to the procreation of children, any more than the valetudinarian or exhausted constitution, but one which is in a mean between them. A man's constitution should be inured to labor, but not to labor which is excessive or of one sort only, such as is practiced

by athletes; he should be capable of all the actions of a freeman. These remarks apply equally to both parents.

Women who are with child should be careful of themselves; they should take exercise and have a nourishing diet. The first of these prescriptions the legislator will easily carry into effect by requiring that they shall take a walk daily to some temple, where they can worship the gods who preside over birth. Their minds, however, unlike their bodies, they ought to keep quiet, for the offspring derive their natures from their mothers as plants do from the earth.

As to the exposure and rearing of children, let there be a law that no deformed child shall live, but that on the ground of an excess in the number of children, if the established customs of the state forbid this (for in our state population has a limit), no child is to be exposed, but when couples have children in excess, let abortion be procured before sense and life have begun; what may or may not be lawfully done in these cases depends on the question of life and sensation.

And now, having determined at what ages men and women are to begin their union, let us also determine how long they shall continue to beget and bear offspring for the state; men who are too old, like men who are too young, produce children who are defective in body and mind; the children of very old men are weakly. The limit then, should be the age which is the prime of their intelligence, and this in most persons, according to the notion of some poets who measure life by periods of seven years, is about fifty; at four or five years or later, they should cease from having families; and from that time forward only cohabit with one another for the sake of health; or for some similar reason.

As to adultery, let it be held disgraceful, in general, for any man or woman to be found in any way unfaithful when they are

married, and called husband and wife. If during the time of bearing children anything of the sort occur, let the guilty person be punished with a loss of privileges in proportion to the offense.

17

After the children have been born, the manner of rearing them may be supposed to have a great effect on their bodily strength. It would appear from the example of animals, and of those nations who desire to create the military habit, that the food which has most milk in it is best suited to human beings; but the less wine the better, if they would escape diseases. Also all the motions to which children can be subjected at their early age are very useful. But in order to preserve their tender limbs from distortion, some nations have had recourse to mechanical appliances which straighten their bodies. To accustom children to the cold from their earliest years is also an excellent practice, which greatly conduces to health, and hardens them for military service. Hence many barbarians have a custom of plunging their children at birth into a cold stream; others, like the Celts, clothe them in a light wrapper only. For human nature should be early habituated to endure all which by habit it can be made to endure; but the process must be gradual. And children, from their natural warmth, may be easily trained to bear cold. Such care should attend them in the first stage of life.

The next period lasts to the age of five; during this no demand should be made upon the child for study or labor, lest its growth be impeded; and there should be sufficient motion to prevent the limbs from being inactive. This can be secured, among other ways, by amusement, but the amusement should not be vulgar

or tiring or effeminate. The Directors of Education, as they are termed, should be careful what tales or stories the children hear, for all such things are designed to prepare the way for the business of later life, and should be for the most part imitations of the occupations which they will hereafter pursue in earnest. Those are wrong who in their laws attempt to check the loud crying and screaming of children, for these contribute towards their growth, and, in a manner, exercise their bodies. Straining the voice has a strengthening effect similar to that produced by the retention of the breath in violent exertions. The Directors of Education should have an eye to their bringing up, and in particular should take care that they are left as little as possible with slaves. For until they are seven years old they must five at home; and therefore, even at this early age, it is to be expected that they should acquire a taint of meanness from what they hear and see. Indeed, there is nothing which the legislator should be more careful to drive away than indecency of speech; for the light utterance of shameful words leads soon to shameful actions. The young especially should never be allowed to repeat or hear anything of the sort. A freeman who is found saying or doing what is forbidden, if he be too young as yet to have the privilege of reclining at the public tables, should be disgraced and beaten, and an elder person degraded as his slavish conduct deserves. And since we do not allow improper language, clearly we should also banish pictures or speeches from the stage which are indecent. Let the rulers take care that there be no image or picture representing unseemly actions, except in the temples of those Gods at whose festivals the law permits even ribaldry, and whom the law also permits to be worshipped by persons of mature age on behalf of themselves, their children, and their wives. But the legislator should not allow youth to be spectators of iambi or of comedy until they are of an age to sit at the public tables and to drink strong wine;

by that time education will have armed them against the evil influences of such representations.

We have made these remarks in a cursory manner – they are enough for the present occasion; but hereafter we will return to the subject and after a fuller discussion determine whether such liberty should or should not be granted, and in what way granted, if at all. Theodorus, the tragic actor, was quite right in saying that he would not allow any other actor, not even if he were quite second-rate, to enter before himself, because the spectators grew fond of the voices which they first heard. And the same principle applies universally to association with things as well as with persons, for we always like best whatever comes first. And therefore youth should be kept strangers to all that is bad, and especially to things which suggest vice or hate. When the five years have passed away, during the two following years they must look on at the pursuits which they are hereafter to learn. There are two periods of life with reference to which education has to be divided, from seven to the age of puberty, and onwards to the age of one and twenty. The poets who divide ages by sevens are in the main right: but we should observe the divisions actually made by nature; for the deficiencies of nature are what art and education seek to fill up.

Let us then first inquire if any regulations are to be laid down about children, and secondly, whether the care of them should be the concern of the state or of private individuals, which latter is in our own day the common custom, and in the third place, what these regulations should be.

Book VIII

1

No one will doubt that the legislator should direct his attention above all to the education of youth; for the neglect of education does harm to the constitution The citizen should be molded to suit the form of government under which he lives. For each government has a peculiar character which originally formed and which continues to preserve it. The character of democracy creates democracy, and the character of oligarchy creates oligarchy; and always the better the character, the better the government.

Again, for the exercise of any faculty or art a previous training and habituation are required; clearly therefore for the practice of virtue. And since the whole city has one end, it is manifest that education should be one and the same for all, and that it should be public, and not private – not as at present, when every one looks after his own children separately, and gives them separate instruction of the sort which he thinks best; the training in things which are of common interest should be the same for all. Neither must we suppose that any one of the citizens belongs to himself, for they all belong to the state, and are each of them a part of the state, and the care of each part is inseparable from the care of the whole. In this particular as in some others the Lacedaemonians are to be praised, for they take the greatest pains about their children, and make education the business of the state.

2

That education should be regulated by law and should be an affair of state is not to be denied, but what should be the character of this public education, and how young persons should be educated, are questions which remain to be considered. As things are, there is disagreement about the subjects. For mankind are by no means agreed about the things to be taught, whether we look to virtue or the best life. Neither is it clear whether education is more concerned with intellectual or with moral virtue. The existing practice is perplexing; no one knows on what principle we should proceed – should the useful in life, or should virtue, or should the higher knowledge, be the aim of our training; all three opinions have been entertained. Again, about the means there is no agreement; for different persons, starting with different ideas about the nature of virtue, naturally disagree about the practice of it. There can be no doubt that children should be taught those useful things which are really necessary, but not all useful things; for occupations are divided into liberal and illiberal; and to young children should be imparted only such kinds of knowledge as will be useful to them without vulgarizing them. And any occupation, art, or science, which makes the body or soul or mind of the freeman less fit for the practice or exercise of virtue, is vulgar; wherefore we call those arts vulgar which tend to deform the body, and likewise all paid employments, for they absorb and degrade the mind. There are also some liberal arts quite proper for a freeman to acquire, but only in a certain degree, and if he attend to them too closely, in order to attain perfection in them, the same evil effects will follow. The object also which a man sets before him makes a great difference; if he does or learns anything for his own sake or for the sake of his friends, or with a view to excellence the action will not appear illiberal; but if done for the sake of others, the very same action will be thought menial and servile. The received subjects

of instruction, as I have already remarked, are partly of a liberal and party of an illiberal character.

3

The customary branches of education are in number four; they are – (1) reading and writing, (2) gymnastic exercises, (3) music, to which is sometimes added (4) drawing. Of these, reading and writing and drawing are regarded as useful for the purposes of life in a variety of ways, and gymnastic exercises are thought to infuse courage. concerning music a doubt may be raised – in our own day most men cultivate it for the sake of pleasure, but originally it was included in education, because nature herself, as has been often said, requires that we should be able, not only to work well, but to use leisure well; for, as I must repeat once again, the first principle of all action is leisure. Both are required, but leisure is better than occupation and is its end; and therefore the question must be asked, what ought we to do when at leisure? Clearly we ought not to be amusing ourselves, for then amusement would be the end of life. But if this is inconceivable, and amusement is needed more amid serious occupations than at other times (for he who is hard at work has need of relaxation, and amusement gives relaxation, whereas occupation is always accompanied with exertion and effort), we should introduce amusements only at suitable times, and they should be our medicines, for the emotion which they create in the soul is a relaxation, and from the pleasure we obtain rest. But leisure of itself gives pleasure and happiness and enjoyment of life, which are experienced, not by the busy man, but by those who have leisure. For he who is occupied has in view some end which he has not attained; but happiness is an end, since all men deem it to be accompanied with pleasure

and not with pain. This pleasure, however, is regarded differently by different persons, and varies according to the habit of individuals; the pleasure of the best man is the best, and springs from the noblest sources. It is clear then that there are branches of learning and education which we must study merely with a view to leisure spent in intellectual activity, and these are to be valued for their own sake; whereas those kinds of knowledge which are useful in business are to be deemed necessary, and exist for the sake of other things. And therefore our fathers admitted music into education, not on the ground either of its necessity or utility, for it is not necessary, nor indeed useful in the same manner as reading and writing, which are useful in money-making, in the management of a household, in the acquisition of knowledge and in political life, nor like drawing, useful for a more correct judgment of the works of artists, nor again like gymnastic, which gives health and strength; for neither of these is to be gained from music. There remains, then, the use of music for intellectual enjoyment in leisure; which is in fact evidently the reason of its introduction, this being one of the ways in which it is thought that a freeman should pass his leisure; as Homer says,

But he who alone should be called to the pleasant feast,

and afterwards he speaks of others whom he describes as inviting

The bard who would delight them all.

And in another place Odysseus says there is no better way of passing life than when men's hearts are merry and

The banqueters in the hall, sitting in order, hear the voice of the minstrel.

It is evident, then, that there is a sort of education in which parents should train their sons, not as being useful or necessary,

but because it is liberal or noble. Whether this is of one kind only, or of more than one, and if so, what they are, and how they are to be imparted, must hereafter be determined. Thus much we are now in a position to say, that the ancients witness to us; for their opinion may be gathered from the fact that music is one of the received and traditional branches of education. Further, it is clear that children should be instructed in some useful things – for example, in reading and writing – not only for their usefulness, but also because many other sorts of knowledge are acquired through them. With a like view they may be taught drawing, not to prevent their making mistakes in their own purchases, or in order that they may not be imposed upon in the buying or selling of articles, but perhaps rather because it makes them judges of the beauty of the human form. To be always seeking after the useful does not become free and exalted souls. Now it is clear that in education practice must be used before theory, and the body be trained before the mind; and therefore boys should be handed over to the trainer, who creates in them the roper habit of body, and to the wrestling-master, who teaches them their exercises.

4

Of those states which in our own day seem to take the greatest care of children, some aim at producing in them an athletic habit, but they only injure their forms and stunt their growth. Although the Lacedaemonians have not fallen into this mistake, yet they brutalize their children by laborious exercises which they think will make them courageous. But in truth, as we have often repeated, education should not be exclusively, or principally, directed to this end. And even if we suppose the Lacedaemonians to be right in their end, they do not attain it.

For among barbarians and among animals courage is found associated, not with the greatest ferocity, but with a gentle and lion like temper. There are many races who are ready enough to kill and eat men, such as the Achaeans and Heniochi, who both live about the Black Sea; and there are other mainland tribes, as bad or worse, who all live by plunder, but have no courage. It is notorious that the Lacedaemonians themselves, while they alone were assiduous in their laborious drill, were superior to others, but now they are beaten both in war and gymnastic exercises. For their ancient superiority did not depend on their mode of training their youth, but only on the circumstance that they trained them when their only rivals did not. Hence we may infer that what is noble, not what is brutal, should have the first place; no wolf or other wild animal will face a really noble danger; such dangers are for the brave man. And parents who devote their children to gymnastics while they neglect their necessary education, in reality vulgarize them; for they make them useful to the art of statesmanship in one quality only, and even in this the argument proves them to be inferior to others. We should judge the Lacedaemonians not from what they have been, but from what they are; for now they have rivals who compete with their education; formerly they had none.

It is an admitted principle, that gymnastic exercises should be employed in education, and that for children they should be of a lighter kind, avoiding severe diet or painful toil, lest the growth of the body be impaired. The evil of excessive training in early years is strikingly proved by the example of the Olympic victors; for not more than two or three of them have gained a prize both as boys and as men; their early training and severe gymnastic exercises exhausted their constitutions. When boyhood is over, three years should be spent in other studies; the period of life which follows may then be devoted to hard exercise and strict diet. Men ought not to labor at the same time with their minds and with their bodies; for the two kinds of labor are opposed to

one another; the labor of the body impedes the mind, and the labor of the mind the body.

5

Concerning music there are some questions which we have already raised; these we may now resume and carry further; and our remarks will serve as a prelude to this or any other discussion of the subject. It is not easy to determine the nature of music, or why any one should have a knowledge of it. Shall we say, for the sake of amusement and relaxation, like sleep or drinking, which are not good in themselves, but are pleasant, and at the same time 'care to cease,' as Euripides says? And for this end men also appoint music, and make use of all three alike – sleep, drinking, music – to which some add dancing. Or shall we argue that music conduces to virtue, on the ground that it can form our minds and habituate us to true pleasures as our bodies are made by gymnastic to be of a certain character? Or shall we say that it contributes to the enjoyment of leisure and mental cultivation, which is a third alternative? Now obviously youths are not to be instructed with a view to their amusement, for learning is no amusement, but is accompanied with pain. Neither is intellectual enjoyment suitable to boys of that age, for it is the end, and that which is imperfect cannot attain the perfect or end. But perhaps it may be said that boys learn music for the sake of the amusement which they will have when they are grown up. If so, why should they learn themselves, and not, like the Persian and Median kings, enjoy the pleasure and instruction which is derived from hearing others? (for surely persons who have made music the business and profession of their lives will be better performers than those who practice only long enough to learn). If they must

learn music, on the same principle they should learn cookery, which is absurd. And even granting that music may form the character, the objection still holds: why should we learn ourselves? Why cannot we attain true pleasure and form a correct judgment from hearing others, like the Lacedaemonians? – for they, without learning music, nevertheless can correctly judge, as they say, of good and bad melodies. Or again, if music should be used to promote cheerfulness and refined intellectual enjoyment, the objection still remains – why should we learn ourselves instead of enjoying the performances of others? We may illustrate what we are saying by our conception of the Gods; for in the poets Zeus does not himself sing or play on the lyre. Nay, we call professional performers vulgar; no freeman would play or sing unless he were intoxicated or in jest. But these matters may be left for the present.

The first question is whether music is or is not to be a part of education. Of the three things mentioned in our discussion, which does it produce? – education or amusement or intellectual enjoyment, for it may be reckoned under all three, and seems to share in the nature of all of them. Amusement is for the sake of relaxation, and relaxation is of necessity sweet, for it is the remedy of pain caused by toil; and intellectual enjoyment is universally acknowledged to contain an element not only of the noble but of the pleasant, for happiness is made up of both. All men agree that music is one of the pleasantest things, whether with or without songs; as Musaeus says:

Song to mortals of all things the sweetest.

Hence and with good reason it is introduced into social gatherings and entertainments, because it makes the hearts of men glad: so that on this ground alone we may assume that the young ought to be trained in it. For innocent pleasures are not

only in harmony with the perfect end of life, but they also provide relaxation. And whereas men rarely attain the end, but often rest by the way and amuse themselves, not only with a view to a further end, but also for the pleasure's sake, it may be well at times to let them find a refreshment in music. It sometimes happens that men make amusement the end, for the end probably contains some element of pleasure, though not any ordinary or lower pleasure; but they mistake the lower for the higher, and in seeking for the one find the other, since every pleasure has a likeness to the end of action. For the end is not eligible for the sake of any future good, nor do the pleasures which we have described exist for the sake of any future good but of the past, that is to say, they are the alleviation of past toils and pains. And we may infer this to be the reason why men seek happiness from these pleasures.

But music is pursued, not only as an alleviation of past toil, but also as providing recreation. And who can say whether, having this use, it may not also have a nobler one? In addition to this common pleasure, felt and shared in by all (for the pleasure given by music is natural, and therefore adapted to all ages and characters), may it not have also some influence over the character and the soul? It must have such an influence if characters are affected by it. And that they are so affected is proved in many ways, and not least by the power which the songs of Olympus exercise; for beyond question they inspire enthusiasm, and enthusiasm is an emotion of the ethical part of the soul. Besides, when men hear imitations, even apart from the rhythms and tunes themselves, their feelings move in sympathy. Since then music is a pleasure, and virtue consists in rejoicing and loving and hating aright, there is clearly nothing which we are so much concerned to acquire and to cultivate as the power of forming right judgments, and of taking delight in good dispositions and noble actions. Rhythm and melody supply imitations of anger and gentleness, and also of courage

and temperance, and of all the qualities contrary to these, and of the other qualities of character, which hardly fall short of the actual affections, as we know from our own experience, for in listening to such strains our souls undergo a change. The habit of feeling pleasure or pain at mere representations is not far removed from the same feeling about realities; for example, if any one delights in the sight of a statue for its beauty only, it necessarily follows that the sight of the original will be pleasant to him. The objects of no other sense, such as taste or touch, have any resemblance to moral qualities; in visible objects there is only a little, for there are figures which are of a moral character, but only to a slight extent, and all do not participate in the feeling about them. Again, figures and colors are not imitations, but signs, of moral habits, indications which the body gives of states of feeling. The connection of them with morals is slight, but in so far as there is any, young men should be taught to look, not at the works of Pauson, but at those of Polygnotus, or any other painter or sculptor who expresses moral ideas. On the other hand, even in mere melodies there is an imitation of character, for the musical modes differ essentially from one another, and those who hear them are differently affected by each. Some of them make men sad and grave, like the so-called Mixolydian, others enfeeble the mind, like the relaxed modes, another, again, produces a moderate and settled temper, which appears to be the peculiar effect of the Dorian; the Phrygian inspires enthusiasm. The whole subject has been well treated by philosophical writers on this branch of education, and they confirm their arguments by facts. The same principles apply to rhythms; some have a character of rest, others of motion, and of these latter again, some have a more vulgar, others a nobler movement. Enough has been said to show that music has a power of forming the character, and should therefore be introduced into the education of the young. The study is suited to the stage of youth, for young persons will

not, if they can help, endure anything which is not sweetened by pleasure, and music has a natural sweetness. There seems to be in us a sort of affinity to musical modes and rhythms, which makes some philosophers say that the soul is a tuning, others, that it possesses tuning.

6

And now we have to determine the question which has been already raised, whether children should be themselves taught to sing and play or not. Clearly there is a considerable difference made in the character by the actual practice of the art. It is difficult, if not impossible, for those who do not perform to be good judges of the performance of others. Besides, children should have something to do, and the rattle of Archytas, which people give to their children in order to amuse them and prevent them from breaking anything in the house, was a capital invention, for a young thing cannot be quiet. The rattle is a toy suited to the infant mind, and education is a rattle or toy for children of a larger growth. We conclude then that they should be taught music in such a way as to become not only critics but performers.

The question what is or is not suitable for different ages may be easily answered; nor is there any difficulty in meeting the objection of those who say that the study of music is vulgar. We reply (1) in the first place, that they who are to be judges must also be performers, and that they should begin to practice early, although when they are older they may be spared the execution; they must have learned to appreciate what is good and to delight in it, thanks to the knowledge which they acquired in their youth. As to (2) the vulgarizing effect which

music is supposed to exercise, this is a question which we shall have no difficulty in determining, when we have considered to what extent freemen who are being trained to political virtue should pursue the art, what melodies and what rhythms they should be allowed to use, and what instruments should be employed in teaching them to play; for even the instrument makes a difference. The answer to the objection turns upon these distinctions; for it is quite possible that certain methods of teaching and learning music do really have a degrading effect. It is evident then that the learning of music ought not to impede the business of riper years, or to degrade the body or render it unfit for civil or military training, whether for bodily exercises at the time or for later studies.

The right measure will be attained if students of music stop short of the arts which are practiced in professional contests, and do not seek to acquire those fantastic marvels of execution which are now the fashion in such contests, and from these have passed into education. Let the young practice even such music as we have prescribed, only until they are able to feel delight in noble melodies and rhythms, and not merely in that common part of music in which every slave or child and even some animals find pleasure.

From these principles we may also infer what instruments should be used. The flute, or any other instrument which requires great skill, as for example the harp, ought not to be admitted into education, but only such as will make intelligent students of music or of the other parts of education. Besides, the flute is not an instrument which is expressive of moral character; it is too exciting. The proper time for using it is when the performance aims not at instruction, but at the relief of the passions. And there is a further objection; the impediment which the flute presents to the use of the voice detracts from its educational value. The ancients therefore were right in

forbidding the flute to youths and freemen, although they had once allowed it. For when their wealth gave them a greater inclination to leisure, and they had loftier notions of excellence, being also elated with their success, both before and after the Persian War, with more zeal than discernment they pursued every kind of knowledge, and so they introduced the flute into education. At Lacedaemon there was a choragus who led the chorus with a flute, and at Athens the instrument became so popular that most freemen could play upon it. The popularity is shown by the tablet which Thrasippus dedicated when he furnished the chorus to Ecphantides. Later experience enabled men to judge what was or was not really conducive to virtue, and they rejected both the flute and several other old-fashioned instruments, such as the Lydian harp, the many-stringed lyre, the 'heptagon,' 'triangle,' 'sambuca,' the like – which are intended only to give pleasure to the hearer, and require extraordinary skill of hand. There is a meaning also in the myth of the ancients, which tells how Athene invented the flute and then threw it away. It was not a bad idea of theirs, that the Goddess disliked the instrument because it made the face ugly; but with still more reason may we say that she rejected it because the acquirement of flute-playing contributes nothing to the mind, since to Athene we ascribe both knowledge and art.

Thus then we reject the professional instruments and also the professional mode of education in music (and by professional we mean that which is adopted in contests), for in this the performer practices the art, not for the sake of his own improvement, but in order to give pleasure, and that of a vulgar sort, to his hearers. For this reason the execution of such music is not the part of a freeman but of a paid performer, and the result is that the performers are vulgarized, for the end at which they aim is bad. The vulgarity of the spectator tends to lower the character of the music and therefore of the performers; they look to him – he makes them what they are, and fashions even

their bodies by the movements which he expects them to exhibit.

7

We have also to consider rhythms and modes, and their use in education. Shall we use them all or make a distinction? and shall the same distinction be made for those who practice music with a view to education, or shall it be some other? Now we see that music is produced by melody and rhythm, and we ought to know what influence these have respectively on education, and whether we should prefer excellence in melody or excellence in rhythm. But as the subject has been very well treated by many musicians of the present day, and also by philosophers who have had considerable experience of musical education, to these we would refer the more exact student of the subject; we shall only speak of it now after the manner of the legislator, stating the general principles.

We accept the division of melodies proposed by certain philosophers into ethical melodies, melodies of action, and passionate or inspiring melodies, each having, as they say, a mode corresponding to it. But we maintain further that music should be studied, not for the sake of one, but of many benefits, that is to say, with a view to (1) education, (2) purgation (the word 'purgation' we use at present without explanation, but when hereafter we speak of poetry, we will treat the subject with more precision); music may also serve (3) for for enjoyment, for relaxation, and for recreation after exertion. It is clear, therefore, that all the modes must be employed by us, but not all of them in the same manner. In education the most ethical modes are to be preferred, but in listening to the

performances of others we may admit the modes of action and passion also. For feelings such as pity and fear, or, again, enthusiasm, exist very strongly in some souls, and have more or less influence over all. Some persons fall into a religious frenzy, whom we see as a result of the sacred melodies – when they have used the melodies that excite the soul to mystic frenzy – restored as though they had found healing and purgation. Those who are influenced by pity or fear, and every emotional nature, must have a like experience, and others in so far as each is susceptible to such emotions, and all are in a manner purged and their souls lightened and delighted. The purgative melodies likewise give an innocent pleasure to mankind. Such are the modes and the melodies in which those who perform music at the theater should be invited to compete. But since the spectators are of two kinds – the one free and educated, and the other a vulgar crowd composed of mechanics, laborers, and the like – there ought to be contests and exhibitions instituted for the relaxation of the second class also. And the music will correspond to their minds; for as their minds are perverted from the natural state, so there are perverted modes and highly strung and unnaturally colored melodies. A man receives pleasure from what is natural to him, and therefore professional musicians may be allowed to practice this lower sort of music before an audience of a lower type. But, for the purposes of education, as I have already said, those modes and melodies should be employed which are ethical, such as the Dorian, as we said before; though we may include any others which are approved by philosophers who have had a musical education. The Socrates of the Republic is wrong in retaining only the Phrygian mode along with the Dorian, and the more so because he rejects the flute; for the Phrygian is to the modes what the flute is to musical instruments – both of them are exciting and emotional. Poetry proves this, for Bacchic frenzy and all similar emotions are most suitably expressed by the

flute, and are better set to the Phrygian than to any other mode. The dithyramb, for example, is acknowledged to be Phrygian, a fact of which the connoisseurs of music offer many proofs, saying, among other things, that Philoxenus, having attempted to compose his Mysians as a dithyramb in the Dorian mode, found it impossible, and fell back by the very nature of things into the more appropriate Phrygian. All men agree that the Dorian music is the gravest and manliest. And whereas we say that the extremes should be avoided and the mean followed, and whereas the Dorian is a mean between the other modes, it is evident that our youth should be taught the Dorian music.

Two principles have to be kept in view, what is possible, what is becoming: at these every man ought to aim. But even these are relative to age; the old, who have lost their powers, cannot very well sing the high-strung modes, and nature herself seems to suggest that their songs should be of the more relaxed kind. Wherefore the musicians likewise blame Socrates, and with justice, for rejecting the relaxed modes in education under the idea that they are intoxicating, not in the ordinary sense of intoxication (for wine rather tends to excite men), but because they have no strength in them. And so, with a view also to the time of life when men begin to grow old, they ought to practice the gentler modes and melodies as well as the others, and, further, any mode, such as the Lydian above all others appears to be, which is suited to children of tender age, and possesses the elements both of order and of education. Thus it is clear that education should be based upon three principles – the mean, the possible, the becoming, these three.

Aristotle - The Athenian Constitution

[Translated by Sir Frederic G. Kenyon]

1

...[They were tried] by a court empanelled from among the noble families, and sworn upon the sacrifices. The part of accuser was taken by Myron. They were found guilty of the sacrilege, and their bodies were cast out of their graves and their race banished for evermore. In view of this expiation, Epimenides the Cretan performed a purification of the city.

2

After this event there was contention for a long time between the upper classes and the populace. Not only was the constitution at this time oligarchical in every respect, but the poorer classes, men, women, and children, were the serfs of the rich. They were known as Pelatae and also as Hectemori, because they cultivated the lands of the rich at the rent thus indicated. The whole country was in the hands of a few persons, and if the tenants failed to pay their rent they were liable to be haled into slavery, and their children with them. All loans secured upon the debtor's person, a custom which prevailed until the time of Solon, who was the first to appear as the champion of the people. But the hardest and bitterest part of the constitution in the eyes of the masses was their state of serfdom. Not but what they were also discontented with every

other feature of their lot; for, to speak generally, they had no part nor share in anything.

3

Now the ancient constitution, as it existed before the time of Draco, was organized as follows. The magistrates were elected according to qualifications of birth and wealth. At first they governed for life, but subsequently for terms of ten years. The first magistrates, both in date and in importance, were the King, the Polemarch, and the Archon. The earliest of these offices was that of the King, which existed from ancestral antiquity. To this was added, secondly, the office of Polemarch, on account of some of the kings proving feeble in war; for it was on this account that Ion was invited to accept the post on an occasion of pressing need. The last of the three offices was that of the Archon, which most authorities state to have come into existence in the time of Medon. Others assign it to the time of Acastus, and adduce as proof the fact that the nine Archons swear to execute their oaths 'as in the days of Acastus,' which seems to suggest that it was in his time that the descendants of Codrus retired from the kingship in return for the prerogatives conferred upon the Archon. Whichever way it may be, the difference in date is small; but that it was the last of these magistracies to be created is shown by the fact that the Archon has no part in the ancestral sacrifices, as the King and the Polemarch have, but exclusively in those of later origin. So it is only at a comparatively late date that the office of Archon has become of great importance, through the dignity conferred by these later additions. The Thesmothetae were many years afterwards, when these offices had already become annual, with the object that they might publicly record all legal

decisions, and act as guardians of them with a view to determining the issues between litigants. Accordingly their office, alone of those which have been mentioned, was never of more than annual duration.

Such, then, is the relative chronological precedence of these offices. At that time the nine Archons did not all live together. The King occupied the building now known as the Boculium, near the Prytaneum, as may be seen from the fact that even to the present day the marriage of the King's wife to Dionysus takes place there. The Archon lived in the Prytaneum, the Polemarch in the Epilyceum. The latter building was formerly called the Polemarcheum, but after Epilycus, during his term of office as Polemarch, had rebuilt it and fitted it up, it was called the Epilyceum. The Thesmothetae occupied the Thesmotheteum. In the time of Solon, however, they all came together into the Thesmotheteum. They had power to decide cases finally on their own authority, not, as now, merely to hold a preliminary hearing. Such then was the arrangement of the magistracies. The Council of Areopagus had as its constitutionally assigned duty the protection of the laws; but in point of fact it administered the greater and most important part of the government of the state, and inflicted personal punishments and fines summarily upon all who misbehaved themselves. This was the natural consequence of the facts that the Archons were elected under qualifications of birth and wealth, and that the Areopagus was composed of those who had served as Archons; for which latter reason the membership of the Areopagus is the only office which has continued to be a life-magistracy to the present day.

4

Such was, in outline, the first constitution, but not very long after the events above recorded, in the archonship of Aristaichmus, Draco enacted his ordinances. Now his constitution had the following form. The franchise was given to all who could furnish themselves with a military equipment. The nine Archons and the Treasurers were elected by this body from persons possessing an unencumbered property of not less than ten minas, the less important officials from those who could furnish themselves with a military equipment, and the generals [Strategi] and commanders of the cavalry [Hipparchi] from those who could show an unencumbered property of not less than a hundred minas, and had children born in lawful wedlock over ten years of age. These officers were required to hold to bail the Prytanes, the Strategi, and the Hipparchi of the preceding year until their accounts had been audited, taking four securities of the same class as that to which the Strategi and the Hipparchi belonged. There was also to be a Council, consisting of four hundred and one members, elected by lot from among those who possessed the franchise. Both for this and for the other magistracies the lot was cast among those who were over thirty years of age; and no one might hold office twice until every one else had had his turn, after which they were to cast the lot afresh. If any member of the Council failed to attend when there was a sitting of the Council or of the Assembly, he paid a fine, to the amount of three drachmas if he was a Pentacosiomedimnus, two if he was a Knight, and One if he was a Zeugites. The Council of Areopagus was guardian of the laws, and kept watch over the magistrates to see that they executed their offices in accordance with the laws. Any person who felt himself wronged might lay an information before the Council of Areopagus, on declaring what law was broken by the wrong done to him. But, as has been said before, loans were

secured upon the persons of the debtors, and the land was in the hands of a few.

5

Since such, then, was the organization of the constitution, and the many were in slavery to the few, the people rose against the upper class. The strife was keen, and for a long time the two parties were ranged in hostile camps against one another, till at last, by common consent, they appointed Solon to be mediator and Archon, and committed the whole constitution to his hands. The immediate occasion of his appointment was his poem, which begins with the words:

I behold, and within my heart deep sadness has claimed its place,

As I mark the oldest home of the ancient Ionian race

Slain by the sword.

In this poem he fights and disputes on behalf of each party in turn against the other, and finally he advises them to come to terms and put an end to the quarrel existing between them. By birth and reputation Solon was one of the foremost men of the day, but in wealth and position he was of the middle class, as is generally agreed, and is, indeed, established by his own evidence in these poems, where he exhorts the wealthy not to be grasping.

But ye who have store of good, who are sated and overflow,

Restrain your swelling soul, and still it and keep it low:

Let the heart that is great within you he trained a lowlier way;

Ye shall not have all at your will, and we will not for ever obey. Indeed, he constantly fastens the blame of the conflict on the rich; and accordingly at the beginning of the poem he says that he fears' the love of wealth and an overweening mind', evidently meaning that it was through these that the quarrel arose.

6

As soon as he was at the head of affairs, Solon liberated the people once and for all, by prohibiting all loans on the security of the debtor's person: and in addition he made laws by which he cancelled all debts, public and private. This measure is commonly called the Seisachtheia [= removal of burdens], since thereby the people had their loads removed from them. In connexion with it some persons try to traduce the character of Solon. It so happened that, when he was about to enact the Seisachtheia, he communicated his intention to some members of the upper class, whereupon, as the partisans of the popular party say, his friends stole a march on him; while those who wish to attack his character maintain that he too had a share in the fraud himself. For these persons borrowed money and bought up a large amount of land, and so when, a short time afterwards, all debts were cancelled, they became wealthy; and this, they say, was the origin of the families which were afterwards looked on as having been wealthy from primeval times. However, the story of the popular party is by far the most probable. A man who was so moderate and public-spirited in all his other actions, that when it was within his power to put his fellow-citizens beneath his feet and establish himself as tyrant,

he preferred instead to incur the hostility of both parties by placing his honour and the general welfare above his personal aggrandisement, is not likely to have consented to defile his hands by such a petty and palpable fraud. That he had this absolute power is, in the first place, indicated by the desperate condition the country; moreover, he mentions it himself repeatedly in his poems, and it is universally admitted. We are therefore bound to consider this accusation to be false.

7

Next Solon drew up a constitution and enacted new laws; and the ordinances of Draco ceased to be used, with the exception of those relating to murder. The laws were inscribed on the wooden stands, and set up in the King's Porch, and all swore to obey them; and the nine Archons made oath upon the stone, declaring that they would dedicate a golden statue if they should transgress any of them. This is the origin of the oath to that effect which they take to the present day. Solon ratified his laws for a hundred years; and the following was the fashion in which he organized the constitution. He divided the population according to property into four classes, just as it had been divided before, namely, Pentacosiomedimni, Knights, Zeugitae, and Thetes. The various magistracies, namely, the nine Archons, the Treasurers, the Commissioners for Public Contracts (Poletae), the Eleven, and Clerks (Colacretae), he assigned to the Pentacosiomedimni, the Knights, and the Zeugitae, giving offices to each class in proportion to the value of their rateable property. To who ranked among the Thetes he gave nothing but a place in the Assembly and in the juries. A man had to rank as a Pentacosiomedimnus if he made, from his own land, five hundred measures, whether liquid or solid. Those ranked as

Knights who made three hundred measures, or, as some say, those who were able to maintain a horse. In support of the latter definition they adduce the name of the class, which may be supposed to be derived from this fact, and also some votive offerings of early times; for in the Acropolis there is a votive offering, a statue of Diphilus, bearing this inscription:

The son of Diphilus, Athenion hight,

Raised from the Thetes and become a knight,

Did to the gods this sculptured charger bring,

For his promotion a thank-offering. And a horse stands in evidence beside the man, implying that this was what was meant by belonging to the rank of Knight. At the same time it seems reasonable to suppose that this class, like the Pentacosiomedimni, was defined by the possession of an income of a certain number of measures. Those ranked as Zeugitae who made two hundred measures, liquid or solid; and the rest ranked as Thetes, and were not eligible for any office. Hence it is that even at the present day, when a candidate for any office is asked to what class he belongs, no one would think of saying that he belonged to the Thetes.

8

The elections to the various offices Solon enacted should be by lot, out of candidates selected by each of the tribes. Each tribe selected ten candidates for the nine archonships, and among these the lot was cast. Hence it is still the custom for each tribe to choose ten candidates by lot, and then the lot is again cast among these. A proof that Solon regulated the elections to office

according to the property classes may be found in the law still in force with regard to the Treasurers, which enacts that they shall be chosen from the Pentacosiomedimni. Such was Solon's legislation with respect to the nine Archons; whereas in early times the Council of Areopagus summoned suitable persons according to its own judgement and appointed them for the year to the several offices. There were four tribes, as before, and four tribe-kings. Each tribe was divided into three Trittyes [=Thirds], with twelve Naucraries in each; and the Naucraries had officers of their own, called Naucrari, whose duty it was to superintend the current receipts and expenditure. Hence, among the laws of Solon now obsolete, it is repeatedly written that the Naucrari are to receive and to spend out of the Naucraric fund. Solon also appointed a Council of four hundred, a hundred from each tribe; but he assigned to the Council of the Areopagus the duty of superintending the laws, acting as before as the guardian of the constitution in general. It kept watch over the affairs of the state in most of the more important matters, and corrected offenders, with full powers to inflict either fines or personal punishment. The money received in fines it brought up into the Acropolis, without assigning the reason for the mulct. It also tried those who conspired for the overthrow of the state, Solon having enacted a process of impeachment to deal with such offenders. Further, since he saw the state often engaged in internal disputes, while many of the citizens from sheer indifference accepted whatever might turn up, he made a law with express reference to such persons, enacting that any one who, in a time civil factions, did not take up arms with either party, should lose his rights as a citizen and cease to have any part in the state.

9

Such, then, was his legislation concerning the magistracies. There are three points in the constitution of Solon which appear to be its most democratic features: first and most important, the prohibition of loans on the security of the debtor's person; secondly, the right of every person who so willed to claim redress on behalf of any one to whom wrong was being done; thirdly, the institution of the appeal to the jurycourts; and it is to this last, they say, that the masses have owed their strength most of all, since, when the democracy is master of the voting-power, it is master of the constitution. Moreover, since the laws were not drawn up in simple and explicit terms (but like the one concerning inheritances and wards of state), disputes inevitably occurred, and the courts had to decide in every matter, whether public or private. Some persons in fact believe that Solon deliberately made the laws indefinite, in order that the final decision might be in the hands of the people. This, however, is not probable, and the reason no doubt was that it is impossible to attain ideal perfection when framing a law in general terms; for we must judge of his intentions, not from the actual results in the present day, but from the general tenor of the rest of his legislation.

10

These seem to be the democratic features of his laws; but in addition, before the period of his legislation, he carried through his abolition of debts, and after it his increase in the standards of weights and measures, and of the currency. During his administration the measures were made larger than those of Pheidon, and the mina, which previously had a standard of

seventy drachmas, was raised to the full hundred. The standard coin in earlier times was the two-drachma piece. He also made weights corresponding with the coinage, sixty-three minas going to the talent; and the odd three minas were distributed among the staters and the other values.

11

When he had completed his organization of the constitution in the manner that has been described, he found himself beset by people coming to him and harassing him concerning his laws, criticizing here and questioning there, till, as he wished neither to alter what he had decided on nor yet to be an object of ill will to every one by remaining in Athens, he set off on a journey to Egypt, with the combined objects of trade and travel, giving out that he should not return for ten years. He considered that there was no call for him to expound the laws personally, but that every one should obey them just as they were written. Moreover, his position at this time was unpleasant. Many members of the upper class had been estranged from him on account of his abolition of debts, and both parties were alienated through their disappointment at the condition of things which he had created. The mass of the people had expected him to make a complete redistribution of all property, and the upper class hoped he would restore everything to its former position, or, at any rate, make but a small change. Solon, however, had resisted both classes. He might have made himself a despot by attaching himself to whichever party he chose, but he preferred, though at the cost of incurring the enmity of both, to be the saviour of his country and the ideal lawgiver.

12

The truth of this view of Solon's policy is established alike by common consent, and by the mention he has himself made of the matter in his poems. Thus:

I gave to the mass of the people such rank as befitted their need,

I took not away their honour, and I granted naught to their greed;

While those who were rich in power, who in wealth were glorious and great,

I bethought me that naught should befall them unworthy their splendour and state;

So I stood with my shield outstretched, and both were sale in its sight,

And I would not that either should triumph, when the triumph was not with right.

Again he declares how the mass of the people ought to be treated: But thus will the people best the voice of their leaders obey, When neither too slack is the rein, nor violence holdeth the sway; For indulgence breedeth a child, the presumption that spurns control,

When riches too great are poured upon men of unbalanced soul.

And again elsewhere he speaks about the persons who wished to redistribute the land: So they came in search of plunder, and their cravings knew no hound, Every one among them deeming

endless wealth would here be found. And that I with glozing smoothness hid a cruel mind within. Fondly then and vainly dreamt they; now they raise an angry din, And they glare askance in anger, and the light within their eyes Burns with hostile flames upon me. Yet therein no justice lies. All I promised, fully wrought I with the gods at hand to cheer, Naught beyond in folly ventured. Never to my soul was dear With a tyrant's force to govern, nor to see the good and base Side by side in equal portion share the rich home of our race.

Once more he speaks of the abolition of debts and of those who before were in servitude, but were released owing to the Seisachtheia:

Of all the aims for which I summoned forth

The people, was there one I compassed not?

Thou, when slow time brings justice in its train,

O mighty mother of the Olympian gods,

Dark Earth, thou best canst witness, from whose breast

I swept the pillars broadcast planted there,

And made thee free, who hadst been slave of yore.

And many a man whom fraud or law had sold

For from his god-built land, an outcast slave,

I brought again to Athens; yea, and some,

Exiles from home through debt's oppressive load,

Speaking no more the dear Athenian tongue,

But wandering far and wide, I brought again;

And those that here in vilest slavery
Crouched ‘neath a master’s frown, I set them free.
Thus might and right were yoked in harmony,
Since by the force of law I won my ends
And kept my promise. Equal laws I gave
To evil and to good, with even hand
Drawing straight justice for the lot of each.
But had another held the goad as
One in whose heart was guile and greediness,
He had not kept the people back from strife.
For had I granted, now what pleased the one,
Then what their foes devised in counterpoise,
Of many a man this state had been bereft.
Therefore I showed my might on every side,
Turning at bay like wolf among the hounds.

And again he reviles both parties for their grumblings in the times that followed:

Nay, if one must lay blame where blame is due,
Wer’t not for me, the people ne’er had set
Their eyes upon these blessings e’en in dreams:
While greater men, the men of wealthier life,
Should praise me and should court me as their friend.

For had any other man, he says, received this exalted post,

He had not kept the people hack, nor ceased

Til he had robbed the richness of the milk.

But I stood forth a landmark in the midst,

And barred the foes from battle.

13

Such then, were Solon’s reasons for his departure from the country. After his retirement the city was still torn by divisions. For four years, indeed, they lived in peace; but in the fifth year after Solon’s government they were unable to elect an Archon on account of their dissensions, and again four years later they elected no Archon for the same reason. Subsequently, after a similar period had elapsed, Damasias was elected Archon; and he governed for two years and two months, until he was forcibly expelled from his office. After this, it was agreed, as a compromise, to elect ten Archons, five from the Eupatridae, three from the Agroeci, and two from the Demiurgi, and they ruled for the year following Damasias. It is clear from this that the Archon was at the time the magistrate who possessed the greatest power, since it is always in connexion with this office that conflicts are seen to arise. But altogether they were in a continual state of internal disorder. Some found the cause and justification of their discontent in the abolition of debts, because thereby they had been reduced to poverty; others were dissatisfied with the political constitution, because it had undergone a revolutionary change; while with others the motive was found in personal rivalries among themselves. The

parties at this time were three in number. First there was the party of the Shore, led by Megacles the son of Alcmeon, which was considered to aim at a moderate form of government; then there were the men of the Plain, who desired an oligarchy and were led by Lycurgus; and thirdly there were the men of the Highlands, at the head of whom was Pisistratus, who was looked on as an extreme democrat. This latter party was reinforced by those who had been deprived of the debts due to them, from motives of poverty, and by those who were not of pure descent, from motives of personal apprehension. A proof of this is seen in the fact that after the tyranny was overthrown a revision was made of the citizen-roll, on the ground that many persons were partaking in the franchise without having a right to it. The names given to the respective parties were derived from the districts in which they held their lands.

14

Pisistratus had the reputation of being an extreme democrat, and he also had distinguished himself greatly in the war with Megara. Taking advantage of this, he wounded himself, and by representing that his injuries had been inflicted on him by his political rivals, he persuaded the people, through a motion proposed by Aristion, to grant him a bodyguard. After he had got these 'club-bearers', as they were called, he made an attack with them on the people and seized the Acropolis. This happened in the archonship of Comeas, thirty-one years after the legislation of Solon. It is related that, when Pisistratus asked for his bodyguard, Solon opposed the request, and declared that in so doing he proved himself wiser than half the people and braver than the rest, – wiser than those who did not see that Pisistratus designed to make himself tyrant, and braver than

those who saw it and kept silence. But when all his words availed nothing he carried forth his armour and set it up in front of his house, saying that he had helped his country so far as lay in his power (he was already a very old man), and that he called on all others to do the same. Solon's exhortations, however, proved fruitless, and Pisistratus assumed the sovereignty. His administration was more like a constitutional government than the rule of a tyrant; but before his power was firmly established, the adherents of Megacles and Lycurgus made a coalition and drove him out. This took place in the archonship of Hegesias, five years after the first establishment of his rule. Eleven years later Megacles, being in difficulties in a party struggle, again opened-negotiations with Pisistratus, proposing that the latter should marry his daughter; and on these terms he brought him back to Athens, by a very primitive and simple-minded device. He first spread abroad a rumour that Athena was bringing back Pisistratus, and then, having found a woman of great stature and beauty, named Phye (according to Herodotus, of the deme of Paeania, but as others say a Thracian flower-seller of the deme of Collytus), he dressed her in a garb resembling that of the goddess and brought her into the city with Pisistratus. The latter drove in on a chariot with the woman beside him, and the inhabitants of the city, struck with awe, received him with adoration.

15

In this manner did his first return take place. He did not, however, hold his power long, for about six years after his return he was again expelled. He refused to treat the daughter of Megacles as his wife, and being afraid, in consequence, of a combination of the two opposing parties, he retired from the

country. First he led a colony to a place called Rhaicelus, in the region of the Thermaic gulf; and thence he passed to the country in the neighbourhood of Mt. Pangaeus. Here he acquired wealth and hired mercenaries; and not till ten years had elapsed did he return to Eretria and make an attempt to recover the government by force. In this he had the assistance of many allies, notably the Thebans and Lygdamis of Naxos, and also the Knights who held the supreme power in the constitution of Eretria. After his victory in the battle at Pallene he captured Athens, and when he had disarmed the people he at last had his tyranny securely established, and was able to take Naxos and set up Lygdamis as ruler there. He effected the disarmament of the people in the following manner. He ordered a parade in full armour in the Theseum, and began to make a speech to the people. He spoke for a short time, until the people called out that they could not hear him, whereupon he bade them come up to the entrance of the Acropolis, in order that his voice might be better heard. Then, while he continued to speak to them at great length, men whom he had appointed for the purpose collected the arms and locked them up in the chambers of the Theseum hard by, and came and made a signal to him that it was done. Pisistratus accordingly, when he had finished the rest of what he had to say, told the people also what had happened to their arms; adding that they were not to be surprised or alarmed, but go home and attend to their private affairs, while he would himself for the future manage all the business of the state.

16

Such was the origin and such the vicissitudes of the tyranny of Pisistratus. His administration was temperate, as has been said

before, and more like constitutional government than a tyranny. Not only was he in every respect humane and mild and ready to forgive those who offended, but, in addition, he advanced money to the poorer people to help them in their labours, so that they might make their living by agriculture. In this he had two objects, first that they might not spend their time in the city but might be scattered over all the face of the country, and secondly that, being moderately well off and occupied with their own business, they might have neither the wish nor the time to attend to public affairs. At the same time his revenues were increased by the thorough cultivation of the country, since he imposed a tax of one tenth on all the produce. For the same reasons he instituted the local justices,' and often made expeditions in person into the country to inspect it and to settle disputes between individuals, that they might not come into the city and neglect their farms. It was in one of these progresses that, as the story goes, Pisistratus had his adventure with the man of Hymettus, who was cultivating the spot afterwards known as 'Tax-free Farm'. He saw a man digging and working at a very stony piece of ground, and being surprised he sent his attendant to ask what he got out of this plot of land. 'Aches and pains', said the man; 'and that's what Pisistratus ought to have his tenth of'. The man spoke without knowing who his questioner was; but Pisistratus was so leased with his frank speech and his industry that he granted him exemption from all taxes. And so in matters in general he burdened the people as little as possible with his government, but always cultivated peace and kept them in all quietness. Hence the tyranny of Pisistratus was often spoken of proverbially as 'the age of gold'; for when his sons succeeded him the government became much harsher. But most important of all in this respect was his popular and kindly disposition. In all things he was accustomed to observe the laws, without giving himself any exceptional privileges. Once he was summoned on a charge of homicide

before the Areopagus, and he appeared in person to make his defence; but the prosecutor was afraid to present himself and abandoned the case. For these reasons he held power long, and whenever he was expelled he regained his position easily. The majority alike of the upper class and of the people were in his favour; the former he won by his social intercourse with them, the latter by the assistance which he gave to their private purses, and his nature fitted him to win the hearts of both. Moreover, the laws in reference to tyrants at that time in force at Athens were very mild, especially the one which applies more particularly to the establishment of a tyranny. The law ran as follows: 'These are the ancestral statutes of the ATHENIANs; if any persons shall make an attempt to establish a tyranny, or if any person shall join in setting up a tyranny, he shall lose his civic rights, both himself and his whole house.'

17

Thus did Pisistratus grow old in the possession of power, and he died a natural death in the archonship of Philoneos, three and thirty years from the time at which he first established himself as tyrant, during nineteen of which he was in possession of power; the rest he spent in exile. It is evident from this that the story is mere gossip which states that Pisistratus was the youthful favourite of Solon and commanded in the war against Megara for the recovery of Salamis. It will not harmonize with their respective ages, as any one may see who will reckon up the years of the life of each of them, and the dates at which they died. After the death of Pisistratus his sons took up the government, and conducted it on the same system. He had two sons by his first and legitimate wife, Hippias and Hipparchus, and two by his Argive consort, Iophon and Hegesistratus, who

was surnamed Thessalus. For Pisistratus took a wife from Argos, Timonassa, the daughter of a man of Argos, named Gorgilus; she had previously been the wife of Archinus of Ambracia, one of the descendants of Cypselus. This was the origin of his friendship with the Argives, on account of which a thousand of them were brought over by Hegesistratus and fought on his side in the battle at Pallene. Some authorities say that this marriage took place after his first expulsion from Athens, others while he was in possession of the government.

18

Hippias and Hipparchus assumed the control of affairs on grounds alike of standing and of age; but Hippias, as being also naturally of a statesmanlike and shrewd disposition, was really the head of the government. Hipparchus was youthful in disposition, amorous, and fond of literature (it was he who invited to Athens Anacreon, Simonides, and the other poets), while Thessalus was much junior in age, and was violent and headstrong in his behaviour. It was from his character that all the evils arose which befell the house. He became enamoured of Harmodius, and, since he failed to win his affection, he lost all restraint upon his passion, and in addition to other exhibitions of rage he finally prevented the sister of Harmodius from taking the part of a basket-bearer in the Panathenaic procession, alleging as his reason that Harmodius was a person of loose life. Thereupon, in a frenzy of wrath, Harmodius and Aristogeiton did their celebrated deed, in conjunction with a number of confederates. But while they were lying in wait for Hippias in the Acropolis at the time of the Panathenaea (Hippias, at this moment, was awaiting the arrival of the procession, while Hipparchus was organizing its dispatch) they saw one of the

persons privy to the plot talking familiarly with him. Thinking that he was betraying them, and desiring to do something before they were arrested, they rushed down and made their attempt without waiting for the rest of their confederates. They succeeded in killing Hipparchus near the Leocoreum while he was engaged in arranging the procession, but ruined the design as a whole; of the two leaders, Harmodius was killed on the spot by the guards, while Aristogeiton was arrested, and perished later after suffering long tortures. While under the torture he accused many persons who belonged by birth to the most distinguished families and were also personal friends of the tyrants. At first the government could find no clue to the conspiracy; for the current story, that Hippias made all who were taking part in the procession leave their arms, and then detected those who were carrying secret daggers, cannot be true, since at that time they did not bear arms in the processions, this being a custom instituted at a later period by the democracy. According to the story of the popular party, Aristogeiton accused the friends of the tyrants with the deliberate intention that the latter might commit an impious act, and at the same time weaken themselves, by putting to death innocent men who were their own friends; others say that he told no falsehood, but was betraying the actual accomplices. At last, when for all his efforts he could not obtain release by death, he promised to give further information against a number of other persons; and, having induced Hippias to give him his hand to confirm his word, as soon as he had hold of it he reviled him for giving his hand to the murderer of his brother, till Hippias, in a frenzy of rage, lost control of himself and snatched out his dagger and dispatched him.

19

After this event the tyranny became much harsher. In consequence of his vengeance for his brother, and of the execution and banishment of a large number of persons, Hippias became a distrusted and an embittered man. About three years after the death of Hipparchus, finding his position in the city insecure, he set about fortifying Munichia, with the intention of establishing himself there. While he was still engaged on this work, however, he was expelled by Cleomenes, king of Lacedaemon, in consequence of the Spartans being continually incited by oracles to overthrow the tyranny. These oracles were obtained in the following way. The Athenian exiles, headed by the Alcmeonidae, could not by their own power effect their return, but failed continually in their attempts. Among their other failures, they fortified a post in Attica, Lipsydrium, above Mt. Parnes, and were there joined by some partisans from the city; but they were besieged by the tyrants and reduced to surrender. After this disaster the following became a popular drinking song:

Ah! Lipsydrium, faithless friend!

Lo, what heroes to death didst send,

Nobly born and great in deed!

Well did they prove themselves at need

Of noble sires a noble seed.

Having failed, then, in very other method, they took the contract for rebuilding the temple at Delphi, thereby obtaining ample funds, which they employed to secure the help of the Lacedaemonians. All this time the Pythia kept continually enjoining on the Lacedaemonians who came to consult the oracle, that they must free Athens; till finally she succeeded in

impelling the Spartans to that step, although the house of Pisistratus was connected with them by ties of hospitality. The resolution of the Lacedaemonians was, however, at least equally due to the friendship which had been formed between the house of Pisistratus and Argos. Accordingly they first sent Anchimolus by sea at the head of an army; but he was defeated and killed, through the arrival of Cineas of Thessaly to support the sons of Pisistratus with a force of a thousand horsemen. Then, being roused to anger by this disaster, they sent their king, Cleomenes, by land at the head of a larger force; and he, after defeating the Thessalian cavalry when they attempted to intercept his march into Attica, shut up Hippias within what was known as the Pelargic wall and blockaded him there with the assistance of the Athenians. While he was sitting down before the place, it so happened that the sons of the Pisistratidae were captured in an attempt to slip out; upon which the tyrants capitulated on condition of the safety of their children, and surrendered the Acropolis to the Athenians, five days being first allowed them to remove their effects. This took place in the archonship of Harpactides, after they had held the tyranny for about seventeen years since their father's death, or in all, including the period of their father's rule, for nine-and-forty years.

20

After the overthrow of the tyranny, the rival leaders in the state were Isagoras son of Tisander, a partisan of the tyrants, and Cleisthenes, who belonged to the family of the Alcmeonidae. Cleisthenes, being beaten in the political clubs, called in the people by giving the franchise to the masses. Thereupon Isagoras, finding himself left inferior in power, invited

Cleomenes, who was united to him by ties of hospitality, to return to Athens, and persuaded him to 'drive out the pollution', a plea derived from the fact that the Alcmeonidae were suppposed to be under the curse of pollution. On this Cleisthenes retired from the country, and Cleomenes, entering Attica with a small force, expelled, as polluted, seven hundred Athenian families. Having effected this, he next attempted to dissolve the Council, and to set up Isagoras and three hundred of his partisans as the supreme power in the state. The Council, however, resisted, the populace flocked together, and Cleomenes and Isagoras, with their adherents, took refuge in the Acropolis. Here the people sat down and besieged them for two days; and on the third they agreed to let Cleomenes and all his followers de art, while they summoned Cleisthenes and the other exiles back to Athens. When the people had thus obtained the command of affairs, Cleisthenes was their chief and popular leader. And this was natural; for the Alcmeonidae were perhaps the chief cause of the expulsion of the tyrants, and for the greater part of their rule were at perpetual war with them. But even earlier than the attempts of the Alcmeonidae, one Cedon made an attack on the tyrants; when there came another popular drinking song, addressed to him:

Pour a health yet again, boy, to Cedon; forget not this duty to do,

If a health is an honour befitting the name of a good man and true.

21

The people, therefore, had good reason to place confidence in Cleisthenes. Accordingly, now that he was the popular leader, three years after the expulsion of the tyrants, in the archonship

of Isagoras, his first step was to distribute the whole population into ten tribes in place of the existing four, with the object of intermixing the members of the different tribes, and so securing that more persons might have a share in the franchise. From this arose the saying ‘Do not look at the tribes’, addressed to those who wished to scrutinize the lists of the old families. Next he made the Council to consist of five hundred members instead of four hundred, each tribe now contributing fifty, whereas formerly each had sent a hundred. The reason why he did not organize the people into twelve tribes was that he might not have to use the existing division into trittyes; for the four tribes had twelve trittyes, so that he would not have achieved his object of redistributing the population in fresh combinations. Further, he divided the country into thirty groups of demes, ten from the districts about the city, ten from the coast, and ten from the interior. These he called trittyes; and he assigned three of them by lot to each tribe, in such a way that each should have one portion in each of these three localities. All who lived in any given deme he declared fellow-demesmen, to the end that the new citizens might not be exposed by the habitual use of family names, but that men might be officially described by the names of their demes; and accordingly it is by the names of their demes that the Athenians speak of one another. He also instituted Demarchs, who had the same duties as the previously existing Naucrari, – the demes being made to take the place of the naucraries. He gave names to the demes, some from the localities to which they belonged, some from the persons who founded them, since some of the areas no longer corresponded to localities possessing names. On the other hand he allowed every one to retain his family and clan and religious rites according to ancestral custom. The names given to the tribes were the ten which the Pythia appointed out of the hundred selected national heroes.

22

By these reforms the constitution became much more democratic than that of Solon. The laws of Solon had been obliterated by disuse during the period of the tyranny, while Cleisthenes substituted new ones with the object of securing the goodwill of the masses. Among these was the law concerning ostracism. Four year after the establishment of this system, in the archonship of Hermocreon, they first imposed upon the Council of Five Hundred the oath which they take to the present day. Next they began to elect the generals by tribes, one from each tribe, while the Polemarch was the commander of the whole army. Then, eleven years later, in the archonship of Phaenippus they won the battle of Marathon; and two years after this victory, when the people had now gained self-confidence, they for the first time made use of the law of ostracism. This had originally been passed as a precaution against men in high office, because Pisistratus took advantage of his position as a popular leader and general to make himself tyrant; and the first person ostracized was one of his relatives, Hipparchus son of Charmus, of the deme of Collytus, the very person on whose account especially Cleisthenes had enacted the law, as he wished to get rid of him. Hitherto, however, he had escaped; for the Athenians, with the usual leniency of the democracy, allowed all the partisans of the tyrants, who had not joined in their evil deeds in the time of the troubles to remain in the city; and the chief and leader of these was Hipparchus. Then in the very next year, in the archonship of Telesinus, they for the first time since the tyranny elected, tribe by tribe, the nine Archons by lot out of the five hundred candidates selected by the demes, all the earlier ones having been elected by vote; and in the same year Megacles son of Hippocrates, of the deme of Alopece, was ostracized. Thus for three years they continued to

ostracize the friends of the tyrants, on whose account the law had been passed; but in the following year they began to remove others as well, including any one who seemed to be more powerful than was expedient. The first person unconnected with the tyrants who was ostracized was Xanthippus son of Ariphron. Two years later, in the archonship of Nicodemus, the mines of Maroneia were discovered, and the state made a profit of a hundred talents from the working of them. Some persons advised the people to make a distribution of the money among themselves, but this was prevented by Themistocles. He refused to say on what he proposed to spend the money, but he bade them lend it to the hundred richest men in Athens, one talent to each, and then, if the manner in which it was employed pleased the people, the expenditure should be charged to the state, but otherwise the state should receive the sum back from those to whom it was lent. On these terms he received the money and with it he had a hundred triremes built, each of the hundred individuals building one; and it was with these ships that they fought the battle of Salamis against the barbarians. About this time Aristides the son of Lysimachus was ostracized. Three years later, however, in the archonship of Hypsichides, all the ostracized persons were recalled, on account of the advance of the army of Xerxes; and it was laid down for the future that persons under sentence of ostracism must live between Geraestus and Scyllaeum, on pain of losing their civic rights irrevocably.

23

So far, then, had the city progressed by this time, growing gradually with the growth of the democracy; but after the Persian wars the Council of Areopagus once more developed

strength and assumed the control of the state. It did not acquire this supremacy by virtue of any formal decree, but because it had been the cause of the battle of Salamis being fought. When the generals were utterly at a loss how to meet the crisis and made proclamation that every one should see to his own safety, the Areopagus provided a donation of money, distributing eight drachmas to each member of the ships' crews, and so prevailed on them to go on board. On these grounds people bowed to its prestige; and during this period Athens was well administered. At this time they devoted themselves to the prosecution of the war and were in high repute among the Greeks, so that the command by sea was conferred upon them, in spite of the opposition of the Lacedaemonians. The leaders of the people during this period were Aristides, of Lysimachus, and Themistocles, son of Lysimachus, and Themistocles, son of Neocles, of whom the latter appeared to devote himself to the conduct of war, while the former had the reputation of being a clever statesman and the most upright man of his time. Accordingly the one was usually employed as general, the other as political adviser. The rebuilding of the fortifications they conducted in combination, although they were political opponents; but it was Aristides who, seizing the opportunity afforded by the discredit brought upon the Lacedaemonians by Pausanias, guided the public policy in the matter of the defection of the Ionian states from the alliance with Sparta. It follows that it was he who made the first assessment of tribute from the various allied states, two years after the battle of Salamis, in the archonship of Timosthenes; and it was he who took the oath of offensive and defensive alliance with the Ionians, on which occasion they cast the masses of iron into the sea.

24

After this, seeing the state growing in confidence and much wealth accumulated, he advised the people to lay hold of the leadership of the league, and to quit the country districts and settle in the city. He pointed out to them that all would be able to gain a living there, some by service in the army, others in the garrisons, others by taking a part in public affairs; and in this way they would secure the leadership. This advice was taken; and when the people had assumed the supreme control they proceeded to treat their allies in a more imperious fashion, with the exception of the Chians, Lesbians, and Samians. These they maintained to protect their empire, leaving their constitutions untouched, and allowing them to retain whatever dominion they then possessed. They also secured an ample maintenance for the mass of the population in the way which Aristides had pointed out to them. Out of the proceeds of the tributes and the taxes and the contributions of the allies more than twenty thousand persons were maintained. There were 6,000 jurymen, 1,600 bowmen, 1,200 Knights, 500 members of the Council, 500 guards of the dockyards, besides fifty guards in the Acropolis. There were some 700 magistrates at home, and some 700 abroad. Further, when they subsequently went to war, there were in addition 2,500 heavy-armed troops, twenty guard-ships, and other ships which collected the tributes, with crews amounting to 2,000 men, selected by lot; and besides these there were the persons maintained at the Prytaneum, and orphans, and gaolers, since all these were supported by the state.

25

Such was the way in which the people earned their livelihood. The supremacy of the Areopagus lasted for about seventeen years after the Persian wars, although gradually declining. But as the strength of the masses increased, Ephialtes, son of Sophonides, a man with a reputation for incorruptibility and public virtue, who had become the leader of the people, made an attack upon that Council. First of all he ruined many of its members by bringing actions against them with reference to their administration. Then, in the archonship of Conon, he stripped the Council of all the acquired prerogatives from which it derived its guardianship of the constitution, and assigned some of them to the Council of Five Hundred, and others to the Assembly and the law-courts. In this revolution he was assisted by Themistocles, who was himself a member of the Areopagus, but was expecting to be tried before it on a charge of treasonable dealings with Persia. This made him anxious that it should be overthrown, and accordingly he warned Ephialtes that the Council intended to arrest him, while at the same time he informed the Areopagites that he would reveal to them certain persons who were conspiring to subvert the constitution. He then conducted the representatives delegated by the Council to the residence of Ephialtes, promising to show them the conspirators who assembled there, and proceeded to converse with them in an earnest manner. Ephialtes, seeing this, was seized with alarm and took refuge in suppliant guise at the altar. Every one was astounded at the occurrence, and presently, when the Council of Five Hundred met, Ephialtes and Themistocles together proceeded to denounce the Areopagus to them. This they repeated in similar fashion in the Assembly, until they succeeded in depriving it of its power. Not long afterwards, however, Ephialtes was assassinated by Aristodicus of Tanagra. In this way was the Council of Areopagus deprived of its guardianship of the state.

26

After this revolution the administration of the state became more and more lax, in consequence of the eager rivalry of candidates for popular favour. During this period the moderate party, as it happened, had no real chief, their leader being Cimon son of Miltiades, who was a comparatively young man, and had been late in entering public life; and at the same time the general populace suffered great losses by war. The soldiers for active service were selected at that time from the roll of citizens, and as the generals were men of no military experience, who owed their position solely to their family standing, it continually happened that some two or three thousand of the troops perished on an expedition; and in this way the best men alike of the lower and the upper classes were exhausted. Consequently in most matters of administration less heed was paid to the laws than had formerly been the case. No alteration, however, was made in the method of election of the nine Archons, except that five years after the death of Ephialtes it was decided that the candidates to be submitted to the lot for that office might be selected from the Zeugitae as well as from the higher classes. The first Archon from that class was Mnesitheides. Up to this time all the Archons had been taken from the Pentacosiomedimni and Knights, while the Zeugitae were confined to the ordinary magistracies, save where an evasion of the law was overlooked. Four years later, in the archonship of Lysicrates, thirty 'local justices', as they as they were called, were re-established; and two years afterwards, in the archonship of Antidotus, consequence of the great increase in the number of citizens, it was resolved, on the motion of

Pericles, that no one should admitted to the franchise who was not of citizen birth by both parents.

27

After this Pericles came forward as popular leader, having first distinguished himself while still a young man by prosecuting Cimon on the audit of his official accounts as general. Under his auspices the constitution became still more democratic. He took away some of the privileges of the Areopagus, and, above all, he turned the policy of the state in the direction of sea power, which caused the masses to acquire confidence in themselves and consequently to take the conduct of affairs more and more into their own hands. Moreover, forty-eight years after the battle of Salamis, in the archonship of Pythodorus, the Peloponnesian war broke out, during which the populace was shut up in the city and became accustomed to gain its livelihood by military service, and so, partly voluntarily and partly involuntarily, determined to assume the administration of the state itself. Pericles was also the first to institute pay for service in the law-courts, as a bid for popular favour to counterbalance the wealth of Cimon. The latter, having private possessions on a regal scale, not only performed the regular public services magnificently, but also maintained a large number of his fellow-demesmen. Any member of the deme of Laciadae could go every day to Cimon's house and there receive a reasonable provision; while his estate was guarded by no fences, so that any one who liked might help himself to the fruit from it. Pericles' private property was quite unequal to this magnificence and accordingly he took the advice of Damonides of Oia (who was commonly supposed to be the person who prompted Pericles in most of his measures, and was therefore

subsequently ostracized), which was that, as he was beaten in the matter of private possessions, he should make gifts to the people from their own property; and accordingly he instituted pay for the members of the juries. Some critics accuse him of thereby causing a deterioration in the character of the juries, since it was always the common people who put themselves forward for selection as jurors, rather than the men of better position. Moreover, bribery came into existence after this, the first person to introduce it being Anytus, after his command at Pylos. He was prosecuted by certain individuals on account of his loss of Pylos, but escaped by bribing the jury.

28

So long, however, as Pericles was leader of the people, things went tolerably well with the state; but when he was dead there was a great change for the worse. Then for the first time did the people choose a leader who was of no reputation among men of good standing, whereas up to this time such men had always been found as leaders of the democracy. The first leader of the people, in the very beginning of things, was Solon, and the second was Pisistratus, both of them men of birth and position. After the overthrow of the tyrants there was Cleisthenes, a member of the house of the Alcmeonidae; and he had no rival opposed to him after the expulsion of the party of Isagoras. After this Xanthippus was the leader of the people, and Miltiades of the upper class. Then came Themistocles and Aristides, and after them Ephialtes as leader of the people, and Cimon son of Miltiades of the wealthier class. Pericles followed as leader of the people, and Thucydides, who was connected by marriage with Cimon, of the opposition. After the death of Pericles, Nicias, who subsequently fell in Sicily, appeared as

leader of the aristocracy, and Cleon son of Cleaenetus of the people. The latter seems, more than any one else, to have been the cause of the corruption of the democracy by his wild undertakings; and he was the first to use unseemly shouting and coarse abuse on the Bema, and to harangue the people with his cloak girt up short about him, whereas all his predecessors had spoken decently and in order. These were succeeded by Theramenes son of Hagnon as leader of the one party, and the lyre-maker Cleophon of the people. It was Cleophon who first granted the twoobol donation for the theatrical performances, and for some time it continued to be given; but then Callicrates of Paeania ousted him by promising to add a third obol to the sum. Both of these persons were subsequently condemned to death; for the people, even if they are deceived for a time, in the end generally come to detest those who have beguiled them into any unworthy action. After Cleophon the popular leadership was occupied successively by the men who chose to talk the biggest and pander the most to the tastes of the majority, with their eyes fixed only on the interests of the moment. The best statesmen at Athens, after those of early times, seem to have been Nicias, Thucydides, and Theramenes. As to Nicias and Thucydides, nearly every one agrees that they were not merely men of birth and character, but also statesmen, and that they ruled the state with paternal care. On the merits of Theramenes opinion is divided, because it so happened that in his time public affairs were in a very stormy state. But those who give their opinion deliberately find him, not, as his critics falsely assert, overthrowing every kind of constitution, but supporting every kind so long as it did not transgress laws; thus showing that he was able, as every good citizen should be, to live under any form of constitution, while he refused to countenance illegality and was its constant enemy.

29

So long as the fortune of the war continued even, the Athenians preserved the democracy; but after the disaster in Sicily, when the Lacedaemonians had gained the upper hand through their alliance with the king of Persia, they were compelled to abolish the democracy and establish in its place the constitution of the Four Hundred. The speech recommending this course before the vote was made by Melobius, and the motion was proposed by Pythodorus of Anaphlystus; but the real argument which persuaded the majority was the belief that the king of Persia was more likely to form an alliance with them if the constitution were on an oligarchical basis. The motion of Pythodorus was to the following effect. The popular Assembly was to elect twenty persons, over forty years of age, who, in conjunction with the existing ten members of the Committee of Public Safety, after taking an oath that they would frame such measures as they thought best for the state, should then prepare proposals for the public. safety. In addition, any other person might make proposals, so that of all the schemes before them the people might choose the best. Cleitophon concurred with the motion of Pythodorus, but moved that the committee should also investigate the ancient laws enacted by Cleisthenes when he created the democracy, in order that they might have these too before them and so be in a position to decide wisely; his suggestion being that the constitution of Cleisthenes was not really democratic, but closely akin to that of Solon. When the committee was elected, their first proposal was that the Prytanes should be compelled to put to the vote any motion that was offered on behalf of the public safety. Next they abolished all indictments for illegal proposals, all impeachments and pubic prosecutions, in order that every Athenian should be free to give his counsel on the situation, if

he chose; and they decreed that if any person imposed a fine on any other for his acts in this respect, or prosecuted him or summoned him before the courts, he should, on an information being laid against him, be summarily arrested and brought before the generals, who should deliver him to the Eleven to be put to death. After these preliminary measures, they drew up the constitution in the following manner. The revenues of the state were not to be spent on any purpose except the war. All magistrates should serve without remuneration for the period of the war, except the nine Archons and the Prytanes for the time being, who should each receive three obols a day. The whole of the rest of the administration was to be committed, for the period of the war, to those Athenians who were most capable of serving the state personally or pecuniarily, to the number of not less than five thousand. This body was to have full powers, to the extent even of making treaties with whomsoever they willed; and ten representatives, over forty years of age, were to be elected from each tribe to draw up the list of the Five Thousand, after taking an oath on a full and perfect sacrifice.

30

These were the recommendations of the committee; and when they had been ratified the Five Thousand elected from their own number a hundred commissioners to draw up the constitution. They, on their appointment, drew up and produced the following recommendations. There should be a Council, holding office for a year, consisting of men over thirty years of age, serving without pay. To this body should belong the Generals, the nine Archons, the Amphictyonic Registrar (Hieromnemon), the Taxiarchs, the Hipparchs, the Phylarch, the commanders of

garrisons, the Treasurers of Athena and the other gods, ten in number, the Hellenic Treasurers (Hellenotamiae), the Treasurers of the other non-sacred moneys, to the number of twenty, the ten Commissioners of Sacrifices (Hieropoei), and the ten Superintendents of the mysteries. All these were to be appointed by the Council from a larger number of selected candidates, chosen from its members for the time being. The other offices were all to be filled by lot, and not from the members of the Council. The Hellenic Treasurers who actually administered the funds should not sit with the Council. As regards the future, four Councils were to be created, of men of the age already mentioned, and one of these was to be chosen by lot to take office at once, while the others were to receive it in turn, in the order decided by the lot. For this purpose the hundred commissioners were to distribute themselves and all the rest as equally as possible into four parts, and cast lots for precedence, and the selected body should hold office for a year. They were to administer that office as seemed to them best, both with reference to the safe custody and due expenditure of the finances, and generally with regard to all other matters to the best of their ability. If they desired to take a larger number of persons into counsel, each member might call in one assistant of his own choice, subject to the same qualification of age. The Council was to sit once every five days, unless there was any special need for more frequent sittings. The casting of the lot for the Council was to be held by the nine Archons; votes on divisions were to be counted by five tellers chosen by lot from the members of the Council, and of these one was to be selected by lot every day to act as president. These five persons were to cast lots for precedence between the parties wishing to appear before the Council, giving the first place to sacred matters, the second to heralds, the third to embassies, and the fourth to all other subjects; but matters concerning the war might be dealt with, on the motion of the generals, whenever

there was need, without balloting. Any member of the Council who did not enter the Council-house at the time named should be fined a drachma for each day, unless he was away on leave of absence from the Council.

31

Such was the constitution which they drew up for the time to come, but for the immediate present they devised the following scheme. There should be a Council of Four Hundred, as in the ancient constitution, forty from each tribe, chosen out of candidates of more than thirty years of age, selected by the members of the tribes. This Council should appoint the magistrates and draw up the form of oath which they were to take; and in all that concerned the laws, in the examination of official accounts, and in other matters generally, they might act according to their discretion. They must, however, observe the laws that might be enacted with reference to the constitution of the state, and had no power to alter them nor to pass others. The generals should be provisionally elected from the whole body of the Five Thousand, but so soon as the Council came into existence it was to hold an examination of military equipments, and thereon elect ten persons, together with a secretary, and the persons thus elected should hold office during the coming year with full powers, and should have the right, whenever they desired it, of joining in the deliberations of the Council. The Five thousand was also to elect a single Hipparch and ten Phylarchs; but for the future the Council was to elect these officers according to the regulations above laid down. No office, except those of member of the Council and of general, might be held more than once, either by the first occupants or by their successors. With reference to the future distribution of the Four

Hundred into the four successive sections, the hundred commissioners must divide them whenever the time comes for the citizens to join in the Council along with the rest.

32

The hundred commissioners appointed by the Five Thousand drew up the constitution as just stated; and after it had been ratified by the people, under the presidency of Aristomachus, the existing Council, that of the year of Callias, was dissolved before it had completed its term of office. It was dissolved on the fourteenth day of the month Thargelion, and the Four Hundred entered into office on the twenty-first; whereas the regular Council, elected by lot, ought to have entered into office on the fourteenth of Scirophorion. Thus was the oligarchy established, in the archonship of Callias, just about a hundred years after the expulsion of the tyrants. The chief promoters of the revolution were Pisander, Antiphon, and Theramenes, all of them men of good birth and with high reputations for ability and judgement. When, however, this constitution had been established, the Five Thousand were only nominally selected, and the Four Hundred, together with the ten officers on whom full powers had been conferred, occupied the Council-house and really administered the government. They began by sending ambassadors to the Lacedaemonians proposing a cessation of the war on the basis of the existing Position; but as the Lacedaemonians refused to listen to them unless they would also abandon the command of the sea, they broke off the negotiations.

33

For about four months the constitution of the Four Hundred lasted, and Mnasilochus held office as Archon of their nomination for two months of the year of Theopompus, who was Archon for the remaining ten. On the loss of the naval battle of Eretria, however, and the revolt of the whole of Euboea except Oreum, the indignation of the people was greater than at any of the earlier disasters, since they drew far more supplies at this time from Euboea than from Attica itself. Accordingly they deposed the Four Hundred and committed the management of affairs to the Five Thousand, consisting of persons Possessing a military equipment. At the same time they voted that pay should not be given for any public office. The persons chiefly responsible for the revolution were Aristocrates and Theramenes, who disapproved of the action of the Four Hundred in retaining the direction of affairs entirely in their own hands, and referring nothing to the Five Thousand. During this period the constitution of the state seems to have been admirable, since it was a time of war and the franchise was in the hands of those who possessed a military equipment.

34

The people, however, in a very short time deprived the Five Thousand of their monopoly of the government. Then, six years after the overthrow of the Four Hundred, in the archonship of Callias of Angele, battle of Arginusae took place, of which the results were, first, that the ten generals who had gained the victory were all condemned by a single decision, owing to the people being led astray by persons who aroused their indignation; though, as a matter of fact, some of the generals

had actually taken no part in the battle, and others were themselves picked up by other vessels. Secondly, when the Lacedaemonians proposed to evacuate Decelea and make peace on the basis of the existing position, although some of the Athenians supported this proposal, the majority refused to listen to them. In this they were led astray by Cleophon, who appeared in the Assembly drunk and wearing his breastplate, and prevented peace being made, declaring that he would never accept peace unless the Lacedaemonians abandoned their claims on all the cities allied with them. They mismanaged their opportunity then, and in a very short time they learnt their mistake. The next year, in the archonship of Alexias, they suffered the disaster of Aegospotami, the consequence of which was that Lysander became master of the city, and set up the Thirty as its governors. He did so in the following manner. One of the terms of peace stipulated that the state should be governed according to 'the ancient constitution'. Accordingly the popular party tried to preserve the democracy, while that part of the upper class which belonged to the political clubs, together with the exiles who had returned since the peace, aimed at an oligarchy, and those who were not members of any club, though in other respects they considered themselves as good as any other citizens, were anxious to restore the ancient constitution. The latter class included Archinus, Anytus, Cleitophon, Phormisius, and many others, but their most prominent leader was Theramenes. Lysander, however, threw his influence on the side of the oligarchical party, and the popular Assembly was compelled by sheer intimidation to pass a vote establishing the oligarchy. The motion to this effect was proposed by Dracontides of Aphidna.

35

In this way were the Thirty established in power, in the archonship of Pythodorus. As soon, however, as they were masters of the city, they ignored all the resolutions which had been passed relating to the organization of the constitution, but after appointing a Council of Five Hundred and the other magistrates out of a thousand selected candidates, and associating with themselves ten Archons in Piraeus, eleven superintendents of the prison, and three hundred 'lash-bearers' as attendants, with the help of these they kept the city under their own control. At first, indeed, they behaved with moderation towards the citizens and pretended to administer the state according to the ancient constitution. In pursuance of this policy they took down from the hill of Areopagus the laws of Ephialtes and Archestratus relating to the Areopagite Council; they also repealed such of the statutes of Solon as were obscure, and abolished the supreme power of the law-courts. In this they claimed to be restoring the constitution and freeing it from obscurities; as, for instance, by making the testator free once for all to leave his property as he pleased, and abolishing the existing limitations in cases of insanity, old age, and undue female influence, in order that no opening might be left for professional accusers. In other matters also their conduct was similar. At first, then, they acted on these lines, and they destroyed the professional accusers and those mischievous and evil-minded persons who, to the great detriment of the democracy, had attached themselves to it in order to curry favour with it. With all of this the city was much pleased, and thought that the Thirty were doing it with the best of motives. But so soon as they had got a firmer hold on the city, they spared no class of citizens, but put to death any persons who were eminent for wealth or birth or character. Herein they aimed at removing all whom they had reason to fear, while they

also wished to lay hands on their possessions; and in a short time they put to death not less than fifteen hundred persons.

36

Theramenes, however, seeing the city thus falling into ruin, was displeased with their proceedings, and counselled them to cease such unprincipled conduct and let the better classes have a share in the government. At first they resisted his advice, but when his proposals came to be known abroad, and the masses began to associate themselves with him, they were seized with alarm lest he should make himself the leader of the people and destroy their despotic power. Accordingly they drew up a list of three thousand citizens, to whom they announced that they would give a share in the constitution. Theramenes, however, criticized this scheme also, first on the ground that, while proposing to give all respectable citizens a share in the constitution, they were actually giving it only to three thousand persons, as though all merit were confined within that number; and secondly because they were doing two inconsistent things, since they made the government rest on the basis of force, and yet made the governors inferior in strength to the governed. However, they took no notice of his criticisms, and for a long time put off the publication of the list of the Three Thousand and kept to themselves the names of those who had been placed upon it; and every time they did decide to publish it they proceeded to strike out some of those who had been included in it, and insert others who had been omitted.

37

Now when winter had set in, Thrasybulus and the exiles occupied Phyle, and the force which the Thirty led out to attack them met with a reverse. Thereupon the Thirty decided to disarm the bulk of the population and to get rid of Theramenes; which they did in the following way. They introduced two laws into the Council, which they commanded it to pass; the first of them gave the Thirty absolute power to put to death any citizen who was not included in the list of the Three Thousand, while the second disqualified all persons from participation in the franchise who should have assisted in the demolition of the fort of Eetioneia, or have acted in any way against the Four Hundred who had organized the previous oligarchy. Theramenes had done both, and accordingly, when these laws were ratified, he became excluded from the franchise and the Thirty had full power to put him to death. Theramenes having been thus removed, they disarmed all the people except the Three Thousand, and in every respect showed a great advance in cruelty and crime. They also sent ambassadors to Lacedaemonian to blacken the character of Theramenes and to ask for help; and the Lacedaemonians, in answer to their appeal, sent Callibius as military governor with about seven hundred troops, who came and occupied the Acropolis.

38

These events were followed by the occupation of Munichia by the exiles from Phyle, and their victory over the Thirty and their partisans. After the fight the party of the city retreated, and next day they held a meeting in the marketplace and deposed the Thirty, and elected ten citizens with full powers to bring the

war to a termination. When, however, the Ten had taken over the government they did nothing towards the object for which they were elected, but sent envoys to Lacedaemonian to ask for help and to borrow money. Further, finding that the citizens who possessed the franchise were displeased at their proceedings, they were afraid lest they should be deposed, and consequently, in order to strike terror into them (in which design they succeeded), they arrested Demaretus, one of the most eminent citizens, and put him to death. This gave them a firm hold on the government, and they also had the support of Callibius and his Peloponnesians, together with several of the Knights; for some of the members of this class were the most zealous among the citizens to prevent the return of the exiles from Phyle. When, however, the party in Piraeus and Munichia began to gain the upper hand in the war, through the defection of the whole populace to them, the party in the city deposed the original Ten, and elected another Ten, consisting of men of the highest repute. Under their administration, and with their active and zealous cooperation, the treaty of reconciliation was made and the populace returned to the city. The most prominent members of this board were Rhinon of Paeania and Phayllus of Acherdus, who, even before the arrival of Pausanias, opened negotiations with the party in Piraeus, and after his arrival seconded his efforts to bring about the return of the exiles. For it was Pausanias, the king of the Lacedaemonians, who brought the peace and reconciliation to a fulfillment, in conjunction with the ten commissioners of arbitration who arrived later from Lacedaemonian, at his own earnest request. Rhinon and his colleagues received a vote of thanks for the goodwill shown by them to the people, and though they received their charge under an oligarchy and handed in their accounts under a democracy, no one, either of the party that had stayed in the city or of the exiles that had returned from the Piraeus, brought any complaint against them. On the

contrary, Rhinon was immediately elected general on account of his conduct in this office.

39

This reconciliation was effected in the archonship of Eucleides, on the following terms. All persons who, having remained in the city during the troubles, were now anxious to leave it, were to be free to settle at Eleusis, retaining their civil rights and possessing full and independent powers of self-government, and with the free enjoyment of their own personal property. The temple at Eleusis should be common ground for both parties, and should be under the superintendence of the Ceryces, and the Eumolpidae, according to primitive custom. The settlers at Eleusis should not be allowed to enter Athens, nor the people of Athens to enter Eleusis, except at the season of the mysteries, when both parties should be free from these restrictions. The secessionists should pay their share to the fund for the common defence out of their revenues, just like all the other Athenians. If any of the seceding party wished to take a house in Eleusis, the people would help them to obtain the consent of the owner; but if they could not come to terms, they should appoint three valuers on either side, and the owner should receive whatever price they should appoint. Of the inhabitants of Eleusis, those whom the secessionists wished to remain should be allowed to do so. The list of those who desired to secede should be made up within ten days after the taking of the oaths in the case of persons already in the country, and their actual departure should take place within twenty days; persons at present out of the country should have the same terms allowed to them after their return. No one who settled at Eleusis should be capable of holding any office in Athens until

he should again register himself on the roll as a resident in the city. Trials for homicide, including all cases in which one party had either killed or wounded another, should be conducted according to ancestral practice. There should be a general amnesty concerning past events towards all persons except the Thirty, the Ten, the Eleven, and the magistrates in Piraeus; and these too should be included if they should submit their accounts in the usual way. Such accounts should be given by the magistrates in Piraeus before a court of citizens rated in Piraeus, and by the magistrates in the city before a court of those rated in the city. On these terms those who wished to do so might secede. Each party was to repay separately the money which it had borrowed for the war.

40

When the reconciliation had taken place on these terms, those who had fought on the side of the Thirty felt considerable apprehensions, and a large number intended to secede. But as they put off entering their names till the last moment, as people will do, Archinus, observing their numbers, and being anxious to retain them as citizens, cut off the remaining days during which the list should have remained open; and in this way many persons were compelled to remain, though they did so very unwillingly until they recovered confidence. This is one point in which Archinus appears to have acted in a most statesmanlike manner, and another was his subsequent prosecution of Thrasybulus on the charge of illegality, for a motion by which he proposed to confer the franchise on all who had taken part in the return from Piraeus, although some of them were notoriously slaves. And yet a third such action was when one of the returned exiles began to violate the amnesty,

whereupon Archinus haled him to the Council and persuaded them to execute him without trial, telling them that now they would have to show whether they wished to preserve the democracy and abide by the oaths they had taken; for if they let this man escape they would encourage others to imitate him, while if they executed him they would make an example for all to learn by. And this was exactly what happened; for after this man had been put to death no one ever again broke the amnesty. On the contrary, the Athenians seem, both in public and in private, to have behaved in the most unprecedentedly admirable and public-spirited way with reference to the preceding troubles. Not only did they blot out all memory of former offences, but they even repaid to the Lacedaemonians out of the public purse the money which the Thirty had borrowed for the war, although the treaty required each party, the party of the city and the party of Piraeus, to pay its own debts separately. This they did because they thought it was a necessary first step in the direction of restoring harmony; but in other states, so far from the democratic parties making advances from their own possessions, they are rather in the habit of making a general redistribution of the land. A final reconciliation was made with the secessionists at Eleusis two years after the secession, in the archonship of Xenaenetus.

41

This, however, took place at a later date; at the time of which we are speaking the people, having secured the control of the state, established the constitution which exists at the present day. Pythodorus was Archon at the time, but the democracy seems to have assumed the supreme power with perfect justice, since it had effected its own return by its own exertions. This was the

eleventh change which had taken place in the constitution of Athens. The first modification of the primaeval condition of things was when Ion and his companions brought the people together into a community, for then the people was first divided into the four tribes, and the tribe-kings were created. Next, and first after this, having now some semblance of a constitution, was that which took place in the reign of Theseus, consisting in a slight deviation from absolute monarchy. After this came the constitution formed under Draco, when the first code of laws was drawn up. The third was that which followed the civil war, in the time of Solon; from this the democracy took its rise. The fourth was the tyranny of Pisistratus; the fifth the constitution of Cleisthenes, after the overthrow of the tyrants, of a more democratic character than that of Solon. The sixth was that which followed on the Persian wars, when the Council of Areopagus had the direction of the state. The seventh, succeeding this, was the constitution which Aristides sketched out, and which Ephialtes brought to completion by overthrowing the Areopagite Council; under this the nation, misled by the demagogues, made the most serious mistakes in the interest of its maritime empire. The eighth was the establishment of the Four Hundred, followed by the ninth, the restored democracy. The tenth was the tyranny of the Thirty and the Ten. The eleventh was that which followed the return from Phyle and Piraeus; and this has continued from that day to this, with continual accretions of power to the masses. The democracy has made itself master of everything and administers everything by its votes in the Assembly and by the law-courts, in which it holds the supreme power. Even the jurisdiction of the Council has passed into the hands of the people at large; and this appears to be a judicious change, since small bodies are more open to corruption, whether by actual money or influence, than large ones. At first they refused to allow payment for attendance at the Assembly; but the result

was that people did not attend. Consequently, after the Prytanes had tried many devices in vain in order to induce the populace to come and ratify the votes, Agyrrhius, in the first instance, made a provision of one obol a day, which Heracleides of Clazomenae, nicknamed ‘the king’, increased to two obols, and Agyrrhius again to three.

42

The present state of the constitution is as follows. The franchise is open to all who are of citizen birth by both parents. They are enrolled among the demesmen at the age of eighteen. On the occasion of their enrollment the demesmen give their votes on oath, first whether the candidates appear to be of the age prescribed by the law (if not, they are dismissed back into the ranks of the boys), and secondly whether the candidate is free born and of such parentage as the laws require. Then if they decide that he is not a free man, he appeals to the law-courts, and the demesmen appoint five of their own number to act as accusers; if the court decides that he has no right to be enrolled, he is sold by the state as a slave, but if he wins his case he has a right to be enrolled among the demesmen without further question. After this the Council examines those who have been enrolled, and if it comes to the conclusion that any of them is less than eighteen years of age, it fines the demesmen who enrolled him. When the youths (Ephebi) have passed this examination, their fathers meet by their tribes, and appoint on oath three of their fellow tribesmen, over forty years of age, who, in their opinion, are the best and most suitable persons to have charge of the youths; and of these the Assembly elects one from each tribe as guardian, together with a director, chosen from the general body of Athenians, to control the while. Under

the charge of these persons the youths first of all make the circuit of the temples; then they proceed to Piraeus, and some of them garrison Munichia and some the south shore. The Assembly also elects two trainers, with subordinate instructors, who teach them to fight in heavy armour, to use the bow and javelin, and to discharge a catapult. The guardians receive from the state a drachma apiece for their keep, and the youths four obols apiece. Each guardian receives the allowance for all the members of his tribe and buys the necessary provisions for the common stock (they mess together by tribes), and generally superintends everything. In this way they spend the first year. The next year, after giving a public display of their military evolutions, on the occasion when the Assembly meets in the theatre, they receive a shield and spear from the state; after which they patrol the country and spend their time in the forts. For these two years they are on garrison duty, and wear the military cloak, and during this time they are exempt from all taxes. They also can neither bring an action at law, nor have one brought against them, in order that they may have no excuse for requiring leave of absence; though exception is made in cases of actions concerning inheritances and wards of state, or of any sacrificial ceremony connected with the family. When the two years have elapsed they thereupon take their position among the other citizens. Such is the manner of the enrollment of the citizens and the training of the youths.

43

All the magistrates that are concerned with the ordinary routine of administration are elected by lot, except the Military Treasurer, the Commissioners of the Theoric fund, and the Superintendent of Springs. These are elected by vote, and hold

office from one Panathenaic festival to the next. All military officers are also elected by vote.

The Council of Five Hundred is elected by lot, fifty from each tribe. Each tribe holds the office of Prytanes in turn, the order being determined by lot; the first four serve for thirty-six days each, the last six for thirty-five, since the reckoning is by lunar years. The Prytanes for the time being, in the first place, mess together in the Tholus, and receive a sum of money from the state for their maintenance; and, secondly, they convene the meetings of the Council and the Assembly. The Council they convene every day, unless it is a holiday, the Assembly four times in each prytany. It is also their duty to draw up the programme of the business of the Council and to decide what subjects are to be dealt with on each particular da, and where the sitting is to be held. They also draw up the programme for the meetings of the Assembly. One of these in each prytany is called the 'sovereign' Assembly; in this the people have to ratify the continuance of the magistrates in office, if they are performing their duties properly, and to consider the supply of corn and the defence of the country. On this day, too, impeachments are introduced by those who wish to do so, the lists of property confiscated by the state are read, and also applications for inheritances and wards of state, so that nothing may pass unclaimed without the cognizance of any person concerned. In the sixth prytany, in addition to the business already stated, the question is put to the vote whether it is desirable to hold a vote of ostracism or not; and complaints against professional accusers, whether Athenian or aliens domiciled in Athens, are received, to the number of not more than three of either class, together with cases in which an individual has made some promise to the people and has not performed it. Another Assembly in each prytany is assigned to the hearing of petitions, and at this meeting any one is free, on depositing the petitioner's olive-branch, to speak to the people

concerning any matter, public or private. The two remaining meetings are devoted to all other subjects, and the laws require them to deal with three questions connected with religion, three connected with heralds and embassies, and three on secular subjects. Sometimes questions are brought forward without a preliminary vote of the Assembly to take them into consideration.

Heralds and envoys appear first before the Prytanes, and the bearers of dispatches also deliver them to the same officials.

44

There is a single President of the Prytanes, elected by lot, who presides for a night and a day; he may not hold the office for more than that time, nor may the same individual hold it twice. He keeps the keys of the sanctuaries in which the treasures and public records of the state are preserved, and also the public seal; and he is bound to remain in the Tholus, together with one-third of the Prytanes, named by himself. Whenever the Prytanes convene a meeting of the Council or Assembly, he appoints by lot nine Proedri, one from each tribe except that which holds the office of Prytanes for the time being; and out of these nine he similarly appoints one as President, and hands over the programme for the meeting to them. They take it and see to the preservation of order, put forward the various subjects which are to be considered, decide the results of the votings, and direct the proceedings generally. They also have power to dismiss the meeting. No one may act as President more than once in the year, but he may be a Proedrus once in each prytany.

Elections to the offices of General and Hipparch and all other military commands are held in the Assembly, in such manner as the people decide; they are held after the sixth prytany by the first board of Prytanes in whose term of office the omens are favourable. There has, however, to be a preliminary consideration by the Council in this case also.

45

In former times the Council had full powers to inflict fines and imprisonment and death; but when it had consigned Lysimachus to the executioner, and he was sitting in the immediate expectation of death, Eumelides of Alopece rescued him from its hands, maintaining that no citizen ought to be put to death except on the decision of a court of law. Accordingly a trial was held in a law-court, and Lysimachus was acquitted, receiving henceforth the nickname of 'the man from the drum-head'; and the people deprived the Council thenceforward of the power to inflict death or imprisonment or fine, passing a law that if the Council condemn any person for an offence or inflict a fine, the Thesmothetae shall bring the sentence or fine before the law-court, and the decision of the jurors shall be the final judgement in the matter.

The Council passes judgement on nearly all magistrates, especially those who have the control of money; its judgement, however, is not final, but is subject to an appeal to the lawcourts. Private individuals, also, may lay an information against any magistrate they please for not obeying the laws, but here too there is an appeal to the law-courts if the Council declare the charge proved. The Council also examines those who are to be its members for the ensuing year, and likewise

the nine Archons. Formerly the Council had full power to reject candidates for office as unsuitable, but now they have an appeal to the law-courts. In all these matters, therefore, the Council has no final jurisdiction. It takes, however, preliminary cognizance of all matters brought before the Assembly, and the Assembly cannot vote on any question unless it has first been considered by the Council and placed on the programme by the Prytanes; since a person who carries a motion in the Assembly is liable to an action for illegal proposal on these grounds.

46

The Council also superintends the triremes that are already in existence, with their tackle and sheds, and builds new triremes or quadriremes, whichever the Assembly votes, with tackle and sheds to match. The Assembly appoints master-builders for the ships by vote; and if they do not hand them over completed to the next Council, the old Council cannot receive the customary donation – that being normally given to it during its successor's term of office. For the building of the triremes it appoints ten commissioners, chosen from its own members. The Council also inspects all public buildings, and if it is of opinion that the state is being defrauded, it reports the culprit to the Assembly, and on condemnation hands him over to the law-courts.

47

The Council also co-operates with other magistrates in most of their duties. First there are the treasurers of Athena, ten in

number, elected by lot, one from each tribe. According to the law of Solon – which is still in force – they must be Pentacosiomedimni, but in point of fact the person on whom the lot falls holds the office even though he be quite a poor man. These officers take over charge of the statue of Athena, the figures of Victory, and all the other ornaments of the temple, together with the money, in the presence of the Council. Then there are the Commissioners for Public Contracts (Poletae), ten in number, one chosen by lot from each tribe, who farm out the public contracts. They lease the mines and taxes, in conjunction with the Military Treasurer and the Commissioners of the Theoric fund, in the presence of the Council, and grant, to the persons indicated by the vote of the Council, the mines which are let out by the state, including both the workable ones, which are let for three years, and those which are let under special agreements years. They also sell, in the presence of the Council, the property of those who have gone into exile from the court of the Areopagus, and of others whose goods have been confiscated, and the nine Archons ratify the contracts. They also hand over to the Council lists of the taxes which are farmed out for the year, entering on whitened tablets the name of the lessee and the amount paid. They make separate lists, first of those who have to pay their instalments in each prytany, on ten several tablets, next of those who pay thrice in the year, with a separate tablet for each instalment, and finally of those who pay in the ninth prytany. They also draw up a list of farms and dwellings which have been confiscated and sold by order of the courts; for these too come within their province. In the case of dwellings the value must be paid up in five years, and in that of farms, in ten. The instalments are paid in the ninth prytany. Further, the King-archon brings before the Council the leases of the sacred enclosures, written on whitened tablets. These too are leased for ten years, and the instalments are paid in the prytany; consequently it is in this prytany that the greatest

amount of money is collected. The tablets containing the lists of the instalments are carried into the Council, and the public clerk takes charge of them. Whenever a payment of instalments is to be made he takes from the pigeon-holes the precise list of the sums which are to be paid and struck off on that day, and delivers it to the Receivers-General. The rest are kept apart, in order that no sum may be struck off before it is paid.

48

There are ten Receivers-General (Apodectae), elected by lot, one from each tribe. These officers receive the tablets, and strike off the instalments as they are paid, in the presence of the Council in the Council-chamber, and give the tablets back to the public clerk. If any one fails to pay his instalment, a note is made of it on the tablet; and he is bound to pay double the amount of the deficiency, or, in default, to be imprisoned. The Council has full power by the laws to exact these payments and to inflict this imprisonment. They receive all the instalments, therefore, on one day, and portion the money out among the magistrates; and on the next day they bring up the report of the apportionment, written on a wooden notice-board, and read it out in the Council-chamber, after which they ask publicly in the Council whether any one knows of any malpractice in reference to the apportionment, on the part of either a magistrate or a private individual, and if any one is charged with malpractice they take a vote on it.

The Council also elects ten Auditors (Logistae) by lot from its own members, to audit the accounts of the magistrates for each prytany. They also elect one Examiner of Accounts (Euthunus) by lot from each tribe, with two assessors (Paredri) for each

examiner, whose duty it is to sit at the ordinary market hours, each opposite the statue of the eponymous hero of his tribe; and if any one wishes to prefer a charge, on either public or private grounds, against any magistrate who has passed his audit before the law-courts, within three days of his having so passed, he enters on a whitened tablet his own name and that of the magistrate prosecuted, together with the malpractice that is alleged against him. He also appends his claim for a penalty of such amount as seems to him fitting, and gives in the record to the Examiner. The latter takes it, and if after reading it he considers it proved he hands it over, if a private case, to the local justices who introduce cases for the tribe concerned, while if it is a public case he enters it on the register of the Thesmothetae. Then, if the Thesmothetae accept it, they bring the accounts of this magistrate once more before the law-court, and the decision of the jury stands as the final judgement.

49

The Council also inspects the horses belonging to the state. If a man who has a good horse is found to keep it in bad condition, he is mulcted in his allowance of corn; while those which cannot keep up or which shy and will not stand steady, it brands with a wheel on the jaw, and the horse so marked is disqualified for service. It also inspects those who appear to be fit for service as scouts, and any one whom it rejects is deprived of his horse. It also examines the infantry who serve among the cavalry, and any one whom it rejects ceases to receive his pay. The roll of the cavalry is drawn up by the Commissioners of Enrolment (Catalogeis), ten in number, elected by the Assembly by open vote. They hand over to the Hipparchs and Phylarchs the list of those whom they have enrolled, and these officers

take it and bring it up before the Council, and there open the sealed tablet containing the names of the cavalry. If any of those who have been on the roll previously make affidavit that they are physically incapable of cavalry service, they strike them out; then they call up the persons newly enrolled, and if any one makes affidavit that he is either physically or pecuniarily incapable of cavalry service they dismiss him, but if no such affidavit is made the Council vote whether the individual in question is suitable for the purpose or not. If they vote in the affirmative his name is entered on the tablet; if not, he is dismissed with the others.

Formerly the Council used to decide on the plans for public buildings and the contract for making the robe of Athena; but now this work is done by a jury in the law-courts appointed by lot, since the Council was considered to have shown favouritism in its decisions. The Council also shares with the Military Treasurer the superintendence of the manufacture of the images of Victory and the prizes at the Panathenaic festival.

The Council also examines infirm paupers; for there is a law which provides that persons possessing less than three minas, who are so crippled as to be unable to do any work, are, after examination by the Council, to receive two obols a day from the state for their support. A treasurer is appointed by lot to attend to them.

The Council also, speaking broadly, cooperates in most of the duties of all the other magistrates; and this ends the list of the functions of that body.

50

There are ten Commissioners for Repairs of Temples, elected by lot, who receive a sum of thirty minas from the Receivers-General, and therewith carry out the most necessary repairs in the temples.

There are also ten City Commissioners (Astynomi), of whom five hold office in Piraeus and five in the city. Their duty is to see that female flute – and harp – and lute – players are not hired at more than two drachmas, and if more than one person is anxious to hire the same girl, they cast lots and hire her out to the person to whom the lot falls. They also provide that no collector of sewage shall shoot any of his sewage within ten stradia of the walls; they prevent people from blocking up the streets by building, or stretching barriers across them, or making drain-pipes in mid-air with a discharge into the street, or having doors which open outwards; they also remove the corpses of those who die in the streets, for which purpose they have a body of state slaves assigned to them.

51

Market Commissioners (Agoranomi) are elected by lot, five for Piraeus, five for the city. Their statutory duty is to see that all articles offered for sale in the market are pure and unadulterated.

Commissioners of Weights and Measures (Metronomi) are elected by lot, five for the city, and five for Piraeus. They see that sellers use fair weights and measures.

Formerly there were ten Corn Commissioners (Sitophylaces), elected by lot, five for Piraeus, and five for the city; but now there are twenty for the city and fifteen for Piraeus. Their duties are, first, to see that the unprepared corn in the market is offered for sale at reasonable prices, and secondly, to see that the millers sell barley meal at a price proportionate to that of barley, and that the bakers sell their loaves at a price proportionate to that of wheat, and of such weight as the Commissioners may appoint; for the law requires them to fix the standard weight.

There are ten Superintendents of the Mart, elected by lot, whose duty is to superintend the Mart, and to compel merchants to bring up into the city two-thirds of the corn which is brought by sea to the Corn Mart.

52

The Eleven also are appointed by lot to take care of the prisoners in the state gaol. Thieves, kidnappers, and pickpockets are brought to them, and if they plead guilty they are executed, but if they deny the charge the Eleven bring the case before the law-courts; if the prisoners are acquitted, they release them, but if not, they then execute them. They also bring up before the law-courts the list of farms and houses claimed as state-property; and if it is decided that they are so, they deliver them to the Commissioners for Public Contracts. The Eleven also bring up informations laid against magistrates alleged to be disqualified; this function comes within their province, but some such cases are brought up by the Thesmothetae.

There are also five Introducers of Cases (Eisagogeis), elected by lot, one for each pair of tribes, who bring up the 'monthly' cases

to the law-courts. 'Monthly' cases are these: refusal to pay up a dowry where a party is bound to do so, refusal to pay interest on money borrowed at 12 per cent., or where a man desirous of setting up business in the market has borrowed from another man capital to start with; also cases of slander, cases arising out of friendly loans or partnerships, and cases concerned with slaves, cattle, and the office of trierarch, or with banks. These are brought up as 'monthly' cases and are introduced by these officers; but the Receivers-General perform the same function in cases for or against the farmers of taxes. Those in which the sum concerned is not more than ten drachmas they can decide summarily, but all above that amount they bring into the law-courts as 'monthly' cases.

53

The Forty are also elected by lot, four from each tribe, before whom suitors bring all other cases. Formerly they were thirty in number, and they went on circuit through the demes to hear causes; but after the oligarchy of the Thirty they were increased to forty. They have full powers to decide cases in which the amount at issue does not exceed ten drachmas, but anything beyond that value they hand over to the Arbitrators. The Arbitrators take up the case, and, if they cannot bring the parties to an agreement, they give a decision. If their decision satisfies both parties, and they abide by it, the case is at an end; but if either of the parties appeals to the law-courts, the Arbitrators enclose the evidence, the pleadings, and the laws quoted in the case in two urns, those of the plaintiff in the one, and those of the defendant in the other. These they seal up and, having attached to them the decision of the arbitrator, written out on a tablet, place them in the custody of the four justices

whose function it is to introduce cases on behalf of the tribe of the defendant. These officers take them and bring up the case before the law-court, to a jury of two hundred and one members in cases up to the value of a thousand drachmas, or to one of four hundred and one in cases above that value. No laws or pleadings or evidence may be used except those which were adduced before the Arbitrator, and have been enclosed in the urns.

The Arbitrators are persons in the sixtieth year of their age; this appears from the schedule of the Archons and the Eponymi. There are two classes of Eponymi, the ten who give their names to the tribes, and the forty-two of the years of service. The youths, on being enrolled among the citizens, were formerly registered upon whitened tablets, and the names were appended of the Archon in whose year they were enrolled, and of the Eponymus who had been in course in the preceding year; at the present day they are written on a bronze pillar, which stands in front of the Council-chamber, near the Eponymi of the tribes. Then the Forty take the last of the Eponymi of the years of service, and assign the arbitrations to the persons belonging to that year, casting lots to determine which arbitrations each shall undertake; and every one is compelled to carry through the arbitrations which the lot assigns to him. The law enacts that any one who does not serve as Arbitrator when he has arrived at the necessary age shall lose his civil rights, unless he happens to be holding some other office during that year, or to be out of the country. These are the only persons who escape the duty. Any one who suffers injustice at the hands of the Arbitrator may appeal to the whole board of Arbitrators, and if they find the magistrate guilty, the law enacts that he shall lose his civil rights. The persons thus condemned have, however, in their turn an appeal. The Eponymi are also used in reference to military expeditions; when the men of military age are despatched on service, a notice is put up stating that the men

from such and such an Archon and Eponymus to such and such another Archon and Eponymus are to go on the expedition.

54

The following magistrates also are elected by lot: Five Commissioners of Roads (Hodopoei), who, with an assigned body of public slaves, are required to keep the roads in order: and ten Auditors, with ten assistants, to whom all persons who have held any office must give in their accounts. These are the only officers who audit the accounts of those who are subject to examination, and who bring them up for examination before the law-courts. If they detect any magistrate in embezzlement, the jury condemn him for theft, and he is obliged to repay tenfold the sum he is declared to have misappropriated. If they charge a magistrate with accepting bribes and the jury convict him, they fine him for corruption, and this sum too is repaid tenfold. Or if they convict him of unfair dealing, he is fined on that charge, and the sum assessed is paid without increase, if payment is made before the ninth prytany, but otherwise it is doubled. A tenfold fine is not doubled.

The Clerk of the prytany, as he is called, is also elected by lot. He has the charge of all public documents, and keeps the resolutions which are passed by the Assembly, and checks the transcripts of all other official papers and attends at the sessions of the Council. Formerly he was elected by open vote, and the most distinguished and trustworthy persons were elected to the post, as is known from the fact that the name of this officer is appended on the pillars recording treaties of alliance and grants of consulship and citizenship. Now, however, he is elected by lot. There is, in addition, a Clerk of the Laws,

elected by lot, who attends at the sessions of the Council; and he too checks the transcript of all the laws. The Assembly also elects by open vote a clerk to read documents to it and to the Council; but he has no other duty except that of reading aloud.

The Assembly also elects by lot the Commissioners of Public Worship (Hieropoei) known as the Commissioners for Sacrifices, who offer the sacrifices appointed by oracle, and, in conjunction with the seers, take the auspices whenever there is occasion. It also elects by lot ten others, known as Annual Commissioners, who offer certain sacrifices and administer all the quadrennial festivals except the Panathenaea. There are the following quadrennial festivals: first that of Delos (where there is also a sexennial festival), secondly the Brauronia, thirdly the Heracleia, fourthly the Eleusinia, and fifthly the Panathenaea; and no two of these are celebrated in the same place. To these the Hephaestia has now been added, in the archonship of Cephisophon.

An Archon is also elected by lot for Salamis, and a Demarch for Piraeus. These officers celebrate the Dionysia in these two places, and appoint Choregi. In Salamis, moreover, the name of the Archon is publicly recorded.

55

All the foregoing magistrates are elected by lot, and their powers are those which have been stated. To pass on to the nine Archons, as they are called, the manner of their appointment from the earliest times has been described already. At the present day six Thesmothetae are elected by lot, together with their clerk, and in addition to these an Archon, a King, and a Polemarch. One is elected from each tribe. They are examined

first of all by the Council of Five Hundred, with the exception of the clerk. The latter is examined only in the lawcourt, like other magistrates (for all magistrates, whether elected by lot or by open vote, are examined before entering on their offices); but the nine Archons are examined both in the Council and again in the law-court. Formerly no one could hold the office if the Council rejected him, but now there is an appeal to the law-court, which is the final authority in the matter of the examination. When they are examined, they are asked, first, 'Who is your father, and of what deme? who is your father's father? who is your mother? who is your mother's father, and of what deme?' Then the candidate is asked whether he possesses an ancestral Apollo and a household Zeus, and where their sanctuaries are; next if he possesses a family tomb, and where; then if he treats his parents well, and pays his taxes, and has served on the required military expeditions. When the examiner has put these questions, he proceeds, 'Call the witnesses to these facts'; and when the candidate has produced his witnesses, he next asks, 'Does any one wish to make any accusation against this man?' If an accuser appears, he gives the parties an opportunity of making their accusation and defence, and then puts it to the Council to pass the candidate or not, and to the law-court to give the final vote. If no one wishes to make an accusation, he proceeds at once to the vote. Formerly a single individual gave the vote, but now all the members are obliged to vote on the candidates, so that if any unprincipled candidate has managed to get rid of his accusers, it may still be possible for him to be disqualified before the law-court. When the examination has been thus completed, they proceed to the stone on which are the pieces of the victims, and on which the Arbitrators take oath before declaring their decisions, and witnesses swear to their testimony. On this stone the Archons stand, and swear to execute their office uprightly and according to the laws, and not to receive presents in respect

of the performance of their duties, or, if they do, to dedicate a golden statue. When they have taken this oath they proceed to the Acropolis, and there they repeat it; after this they enter upon their office.

56

The Archon, the King, and the Polemarch have each two assessors, nominated by themselves. These officers are examined in the lawcourt before they begin to act, and give in accounts on each occasion of their acting.

As soon as the Archon enters office, he begins by issuing a proclamation that whatever any one possessed before he entered into office, that he shall possess and hold until the end of his term. Next he assigns Choregi to the tragic poets, choosing three of the richest persons out of the whole body of Athenians. Formerly he used also to assign five Choregi to the comic poets, but now the tribes provide the Choregi for them. Then he receives the Choregi who have been appointed by the tribes for the men's and boys' choruses and the comic poets at the Dionysia, and for the men's and boys' choruses at the Thargelia (at the Dionysia there is a chorus for each tribe, but at the Thargelia one between two tribes, each tribe bearing its share in providing it); he transacts the exchanges of properties for them, and reports any excuses that are tendered, if any one says that he has already borne this burden, or that he is exempt because he has borne a similar burden and the period of his exemption has not yet expired, or that he is not of the required age; since the Choregus of a boys' chorus must be over forty years of age. He also appoints Choregi for the festival at Delos, and a chief of the mission for the thirty oar boat which conveys

the youths thither. He also superintends sacred processions, both that in honour of Asclepius, when the initiated keep house, and that of the great Dionysia – the latter in conjunction with the Superintendents of that festival. These officers, ten in number, were formerly elected by open vote in the Assembly, and used to provide for the expenses of the procession out of their private means; but now one is elected by lot from each tribe, and the state contributes a hundred minas for the expenses. The Archon also superintends the procession at the Thargelia, and that in honour of Zeus the Saviour. He also manages the contests at the Dionysia and the Thargelia.

These, then, are the festivals which he superintends. The suits and indictments which come before him, and which he, after a preliminary inquiry, brings up before the lawcourts, are as follows. Injury to parents (for bringing these actions the prosecutor cannot suffer any penalty); injury to orphans (these actions lie against their guardians); injury to a ward of state (these lie against their guardians or their husbands), injury to an orphan's estate (these too lie against the guardians); mental derangement, where a party charges another with destroying his own property through unsoundness of mind; for appointment of liquidators, where a party refuses to divide property in which others have a share; for constituting a wardship; for determining between rival claims to a wardship; for granting inspection of property to which another party lays claim; for appointing oneself as guardian; and for determining disputes as to inheritances and wards of state. The Archon also has the care of orphans and wards of state, and of women who, on the death of their husbands, declare themselves to be with child; and he has power to inflict a fine on those who offend against the persons under his charge, or to bring the case before the law-courts. He also leases the houses of orphans and wards of state until they reach the age of fourteen, and takes mortgages on them; and if the guardians fail to provide the

necessary food for the children under their charge, he exacts it from them. Such are the duties of the Archon.

57

The King in the first place superintends the mysteries, in conjunction with the Superintendents of Mysteries. The latter are elected in the Assembly by open vote, two from the general body of Athenians, one from the Eumolpidae, and one from the Ceryces. Next, he superintends the Lenaean Dionysia, which consists of a procession and a contest. The procession is ordered by the King and the Superintendents in conjunction; but the contest is managed by the King alone. He also manages all the contests of the torch-race; and to speak broadly, he administers all the ancestral sacrifices. Indictments for impiety come before him, or any disputes between parties concerning priestly rites; and he also determines all controversies concerning sacred rites for the ancient families and the priests. All actions for homicide come before him, and it is he that makes the proclamation requiring polluted persons to keep away from sacred ceremonies. Actions for homicide and wounding are heard, if the homicide or wounding be willful, in the Areopagus; so also in cases of killing by poison, and of arson. These are the only cases heard by that Council. Cases of unintentional homicide, or of intent to kill, or of killing a slave or a resident alien or a foreigner, are heard by the court of Palladium. When the homicide is acknowledged, but legal justification is pleaded, as when a man takes an adulterer in the act, or kills another by mistake in battle, or in an athletic contest, the prisoner is tried in the court of Delphinium. If a man who is in banishment for a homicide which admits of reconcilliation incurs a further charge of killing or wounding, he

is tried in Phreatto, and he makes his defence from a boat moored near the shore. All these cases, except those which are heard in the Areopagus, are tried by the Ephetae on whom the lot falls. The King introduces them, and the hearing is held within sacred precincts and in the open air. Whenever the King hears a case he takes off his crown. The person who is charged with homicide is at all other times excluded from the temples, nor is it even lawful for him to enter the market-place; but on the occasion of his trial he enters the temple and makes his defence. If the actual offender is unknown, the writ runs against 'the doer of the deed'. The King and the tribe-kings also hear the cases in which the guilt rests on inanimate objects and the lower animal.

58

The Polemarch performs the sacrifices to Artemis the huntress and to Enyalius, and arranges the contest at the funeral of those who have fallen in war, and makes offerings to the memory of Harmodius and Aristogeiton. Only private actions come before him, namely those in which resident aliens, both ordinary and privileged, and agents of foreign states are concerned. It is his duty to receive these cases and divide them into ten groups, and assign to each tribe the group which comes to it by lot; after which the magistrates who introduce cases for the tribe hand them over to the Arbitrators. The Polemarch, however, brings up in person cases in which an alien is charged with deserting his patron or neglecting to provide himself with one, and also of inheritances and wards of state where aliens are concerned; and in fact, generally, whatever the Archon does for citizens, the Polemarch does for aliens.

59

The Thesmothetae in the first place have the power of prescribing on what days the lawcourts are to sit, and next of assigning them to the several magistrates; for the latter must follow the arrangement which the Thesmothetae assign. Moreover they introduce impeachments before the Assembly, and bring up all votes for removal from office, challenges of a magistrate's conduct before the Assembly, indictments for illegal proposals, or for proposing a law which is contrary to the interests of the state, complaints against Proedri or their president for their conduct in office, and the accounts presented by the generals. All indictments also come before them in which a deposit has to be made by the prosecutor, namely, indictments for concealment of foreign origin, for corrupt evasion of foreign origin (when a man escapes the disqualification by bribery), for blackmailing accusations, bribery, false entry of another as a state debtor, false testimony to the service of a summons, conspiracy to enter a man as a state debtor, corrupt removal from the list of debtors, and adultery. They also bring up the examinations of all magistrates, and the rejections by the demes and the condemnations by the Council. Moreover they bring up certain private suits in cases of merchandise and mines, or where a slave has slandered a free man. It is they also who cast lots to assign the courts to the various magistrates, whether for private or public cases. They ratify commercial treaties, and bring up the cases which arise out of such treaties; and they also bring up cases of perjury from the Areopagus. The casting of lots for the jurors is conducted by all the nine Archons, with the clerk to the

Thesmothetae as the tenth, each performing the duty for his own tribe. Such are the duties of the nine Archons.

60

There are also ten Commissioners of Games (Athlothetae), elected by lot, one from each tribe. These officers, after passing an examination, serve for four years; and they manage the Panathenaic procession, the contest in music and that in gymnastic, and the horse-race; they also provide the robe of Athena and, in conjunction with the Council, the vases, and they present the oil to the athletes. This oil is collected from the sacred olives. The Archon requisitions it from the owners of the farms on which the sacred olives grow, at the rate of three-quarters of a pint from each plant. Formerly the state used to sell the fruit itself, and if any one dug up or broke down one of the sacred olives, he was tried by the Council of Areopagus, and if he was condemned, the penalty was death. Since, however, the oil has been paid by the owner of the farm, the procedure has lapsed, though the law remains; and the oil is a state charge upon the property instead of being taken from the individual plants. When, then, the Archon has collected the oil for his year of office, he hands it over to the Treasurers to preserve in the Acropolis, and he may not take his seat in the Areopagus until he has paid over to the Treasurers the full amount. The Treasurers keep it in the Acropolis until the Panathenaea, when they measure it out to the Commissioners of Games, and they again to the victorious competitors. The prizes for the victors in the musical contest consist of silver and gold, for the victors in manly vigour, of shields, and for the victors in the gymnastic contest and the horse-race, of oil.

61

All officers connected with military service are elected by open vote. In the first place, ten Generals (Strategi), who were formerly elected one from each tribe, but now are chosen from the whole mass of citizens. Their duties are assigned to them by open vote; one is appointed to command the heavy infantry, and leads them if they go out to war; one to the defence of the country, who remains on the defensive, and fights if there is war within the borders of the country; two to Piraeus, one of whom is assigned to Munichia, and one to the south shore, and these have charge of the defence of the Piraeus; and one to superintend the symmories, who nominates the trierarchs arranges exchanges of properties for them, and brings up actions to decide on rival claims in connexion with them. The rest are dispatched to whatever business may be on hand at the moment. The appointment of these officers is submitted for confirmation in each prytany, when the question is put whether they are considered to be doing their duty. If any officer is rejected on this vote, he is tried in the lawcourt, and if he is found guilty the people decide what punishment or fine shall be inflicted on him; but if he is acquitted he resumes his office. The Generals have full power, when on active service, to arrest any one for insubordination, or to cashier him publicly, or to inflict a fine; the latter is, however, unusual.

There are also ten Taxiarchs, one from each tribe, elected by open vote; and each commands his own tribesmen and appoints captains of companies (Lochagi). There are also two Hipparchs, elected by open vote from the whole mass of the citizens, who command the cavalry, each taking five tribes. They have the same powers as the Generals have in respect of the

infantry, and their appointments are also subject to confirmation. There are also ten Phylarchs, elected by open vote, one from each tribe, to command the cavalry, as the Taxiarchs do the infantry. There is also a Hipparch for Lemnos, elected by open vote, who has charge of the cavalry in Lemnos. There is also a treasurer of the Paralus, and another of the Ammonias, similarly elected.

62

Of the magistrates elected by lot, in former times some including the nine Archons, were elected out of the tribe as a whole, while others, namely those who are now elected in the Theseum, were apportioned among the demes; but since the demes used to sell the elections, these magistrates too are now elected from the whole tribe, except the members of the Council and the guards of the dockyards, who are still left to the demes.

Pay is received for the following services. First the members of the Assembly receive a drachma for the ordinary meetings, and nine obols for the 'sovereign' meeting. Then the jurors at the law-courts receive three obols; and the members of the Council five obols. They Prytanes receive an allowance of an obol for their maintenance. The nine Archons receive four obols apiece for maintenance, and also keep a herald and a flute-player; and the Archon for Salamis receives a drachma a day. The Commissioners for Games dine in the Prytaneum during the month of Hecatombaeon in which the Panathenaic festival takes place, from the fourteenth day onwards. The Amphictyonic deputies to Delos receive a drachma a day from the exchequer of Delos. Also all magistrates sent to Samos, Scyros, Lemnos, or Imbros receive an allowance for their

maintenance. The military offices may be held any number of times, but none of the others more than once, except the membership of the Council, which may be held twice.

63

The juries for the law-courts are chosen by lot by the nine Archons, each for their own tribe, and by the clerk to the Thesmothetae for the tenth. There are ten entrances into the courts, one for each tribe; twenty rooms in which the lots are drawn, two for each tribe; a hundred chests, ten for each tribe; other chests, in which are placed the tickets of the jurors on whom the lot falls; and two vases. Further, staves, equal in number to the jurors required, are placed by the side of each entrance; and counters are put into one vase, equal in number to the staves. These are inscribed with letters of the alphabet beginning with the eleventh (lambda), equal in number to the courts which require to be filled. All persons above thirty years of age are qualified to serve as jurors, provided they are not debtors to the state and have not lost their civil rights. If any unqualified person serves as juror, an information is laid against him, and he is brought before the court; and, if he is convicted, the jurors assess the punishment or fine which they consider him to deserve. If he is condemned to a money fine, he must be imprisoned until he has paid up both the original debt, on account of which the information was laid against him, and also the fine which the court as imposed upon him. Each juror has his ticket of boxwood, on which is inscribed his name, with the name of his father and his deme, and one of the letters of the alphabet up to kappa; for the jurors in their several tribes are divided into ten sections, with approximately an equal number in each letter. When the Thesmothetes has decided by

lot which letters are required to attend at the courts, the servant puts up above each court the letter which has been assigned to it by the lot.

64

The ten chests above mentioned are placed in front of the entrance used by each tribe, and are inscribed with the letters of the alphabet from alpha to kappa. The jurors cast in their tickets, each into the chest on which is inscribed the letter which is on his ticket; then the servant shakes them all up, and the Archon draws one ticket from each chest. The individual so selected is called the Ticket-hanger (Empectes), and his function is to hang up the tickets out of his chest on the bar which bears the same letter as that on the chest. He is chosen by lot, lest, if the Ticket-hanger were always the same person, he might tamper with the results. There are five of these bars in each of the rooms assigned for the lot-drawing. Then the Archon casts in the dice and thereby chooses the jurors from each tribe, room by room. The dice are made of brass, coloured black or white; and according to the number of jurors required, so many white dice are put in, one for each five tickets, while the remainder are black, in the same proportion. As the Archon draws out the dice, the crier calls out the names of the individuals chosen. The Ticket-hanger is included among those selected. Each juror, as he is chosen and answers to his name, draws a counter from the vase, and holding it out with the letter uppermost shows it first to the presiding Archon; and he, when he has seen it, throws the ticket of the juror into the chest on which is inscribed the letter which is on the counter, so that the juror must go into the court assigned to him by lot, and not into one chosen by himself, and that it may be impossible for any one to

collect the jurors of his choice into any particular court. For this purpose chests are placed near the Archon, as many in number as there are courts to be filled that day, bearing the letters of the courts on which the lot has fallen.

65

The juror thereupon, after showing his counter again to the attendant, passes through the barrier into the court. The attendant gives him a staff of the same colour as the court bearing the letter which is on his counter, so as to ensure his going into the court assigned to him by lot; since, if he were to go into any other, he would be betrayed by the colour of his staff. Each court has a certain colour painted on the lintel of the entrance. Accordingly the juror, bearing his staff, enters the court which has the same colour as his staff, and the same letter as his counter. As he enters, he receives a voucher from the official to whom this duty has been assigned by lot. So with their counters and their staves the selected jurors take their seats in the court, having thus completed the process of admission. The unsuccessful candidates receive back their tickets from the Ticket-hangers. The public servants carry the chests from each tribe, one to each court, containing the names of the members of the tribe who are in that court, and hand them over to the officials assigned to the duty of giving back their tickets to the jurors in each court, so that these officials may call them up by name and pay them their fee.

66

When all the courts are full, two ballot boxes are placed in the first court, and a number of brazen dice, bearing the colours of the several courts, and other dice inscribed with the names of the presiding magistrates. Then two of the Thesmothetae, selected by lot, severally throw the dice with the colours into one box, and those with the magistrates' names into the other. The magistrate whose name is first drawn is thereupon proclaimed by the crier as assigned for duty in the court which is first drawn, and the second in the second, and similarly with the rest. The object of this procedure is that no one may know which court he will have, but that each may take the court assigned to him by lot.

When the jurors have come in, and have been assigned to their respective courts, the presiding magistrate in each court draws one ticket out of each chest (making ten in all, one out of each tribe), and throws them into another empty chest. He then draws out five of them, and assigns one to the superintendence of the water-clock, and the other four to the telling of the votes. This is to prevent any tampering beforehand with either the superintendent of the clock or the tellers of the votes, and to secure that there is no malpractice in these respects. The five who have not been selected for these duties receive from them a statement of the order in which the jurors shall receive their fees, and of the places where the several tribes shall respectively gather in the court for this purpose when their duties are completed; the object being that the jurors may be broken up into small groups for the reception of their pay, and not all crowd together and impede one another.

67

These preliminaries being concluded, the cases are called on. If it is a day for private cases, the private litigants are called. Four cases are taken in each of the categories defined in the law, and the litigants swear to confine their speeches to the point at issue. If it is a day for public causes, the public litigants are called, and only one case is tried. Water-clocks are provided, having small supply-tubes, into which the water is poured by which the length of the pleadings is regulated. Ten gallons are allowed for a case in which an amount of more than five thousand drachmas is involved, and three for the second speech on each side. When the amount is between one and five thousand drachmas, seven gallons are allowed for the first speech and two for the second; when it is less than one thousand, five and two. Six gallons are allowed for arbitrations between rival claimants, in which there is no second speech. The official chosen by lot to superintend the water-clock places his hand on the supply tube whenever the clerk is about to read a resolution or law or affidavit or treaty. When, however, a case is conducted according to a set measurement of the day, he does not stop the supply, but each party receives an equal allowance of water. The standard of measurement is the length of the days in the month Poseideon.... The measured day is employed in cases when imprisonment, death, exile, loss of civil rights, or confiscation of goods is assigned as the penalty.

68

Most of the courts consist of 500 members...; and when it is necessary to bring public cases before a jury of 1,000 members, two courts combine for the purpose, the most important cases

of all are brought 1,500 jurors, or three courts. The ballot balls are made of brass with stems running through the centre, half of them having the stem pierced and the other half solid. When the speeches are concluded, the officials assigned to the taking of the votes give each juror two ballot balls, one pierced and one solid. This is done in full view of the rival litigants, to secure that no one shall receive two pierced or two solid balls. Then the official designated for the purpose takes away the jurors staves, in return for which each one as he records his vote receives a brass voucher market with the numeral 3 (because he gets three obols when he gives it up). This is to ensure that all shall vote; since no one can get a voucher unless he votes. Two urns, one of brass and the other of wood, stand in the court, in distinct spots so that no one may surreptitiously insert ballot balls; in these the jurors record their votes. The brazen urn is for effective votes, the wooden for unused votes; and the brazen urn has a lid pierced so as to take only one ballot ball, in order that no one may put in two at a time.

When the jurors are about to vote, the crier demands first whether the litigants enter a protest against any of the evidence; for no protest can be received after the voting has begun. Then he proclaims again, 'The pierced ballot for the plaintiff, the solid for the defendant'; and the juror, taking his two ballot balls from the stand, with his hand closed over the stem so as not to show either the pierced or the solid ballot to the litigants, casts the one which is to count into the brazen urn, and the other into the wooden urn.

69

When all the jurors have voted, the attendants take the urn containing the effective votes and discharge them on to a reckoning board having as many cavities as there are ballot balls, so that the effective votes, whether pierced or solid, may be plainly displayed and easily counted. Then the officials assigned to the taking of the votes tell them off on the board, the solid in one place and the pierced in another, and the crier announces the numbers of the votes, the pierced ballots being for the prosecutor and the solid for the defendant. Whichever has the majority is victorious; but if the votes are equal the verdict is for the defendant. Each juror receives two ballots, and uses one to record his vote, and throws the other away.

Then, if damages have to be awarded, they vote again in the same way, first returning their pay-vouchers and receiving back their staves. Half a gallon of water is allowed to each party for the discussion of the damages. Finally, when all has been completed in accordance with the law, the jurors receive their pay in the order assigned by the lot.

Aristotle – Rhetoric

[Translated by W. Rhys Roberts]

Book I

1

Rhetoric the counterpart of Dialectic. Both alike are concerned with such things as come, more or less, within the general ken of all men and belong to no definite science. Accordingly all men make use, more or less, of both; for to a certain extent all men attempt to discuss statements and to maintain them, to defend themselves and to attack others. Ordinary people do this either at random or through practice and from acquired habit. Both ways being possible, the subject can plainly be handled systematically, for it is possible to inquire the reason why some speakers succeed through practice and others spontaneously; and every one will at once agree that such an inquiry is the function of an art.

Now, the framers of the current treatises on rhetoric have constructed but a small portion of that art. The modes of persuasion are the only true constituents of the art: everything else is merely accessory. These writers, however, say nothing about enthymemes, which are the substance of rhetorical persuasion, but deal mainly with non-essentials. The arousing of prejudice, pity, anger, and similar emotions has nothing to do with the essential facts, but is merely a personal appeal to the man who is judging the case. Consequently if the rules for trials which are now laid down some states – especially in well-governed states – were applied everywhere, such people would have nothing to say. All men, no doubt, think that the laws should prescribe such rules, but some, as in the court of Areopagus, give practical effect to their thoughts and forbid talk

about non-essentials. This is sound law and custom. It is not right to pervert the judge by moving him to anger or envy or pity – one might as well warp a carpenter's rule before using it. Again, a litigant has clearly nothing to do but to show that the alleged fact is so or is not so, that it has or has not happened. As to whether a thing is important or unimportant, just or unjust, the judge must surely refuse to take his instructions from the litigants: he must decide for himself all such points as the law-giver has not already defined for him.

Now, it is of great moment that well-drawn laws should themselves define all the points they possibly can and leave as few as may be to the decision of the judges; and this for several reasons. First, to find one man, or a few men, who are sensible persons and capable of legislating and administering justice is easier than to find a large number. Next, laws are made after long consideration, whereas decisions in the courts are given at short notice, which makes it hard for those who try the case to satisfy the claims of justice and expediency. The weightiest reason of all is that the decision of the lawgiver is not particular but prospective and general, whereas members of the assembly and the jury find it their duty to decide on definite cases brought before them. They will often have allowed themselves to be so much influenced by feelings of friendship or hatred or self-interest that they lose any clear vision of the truth and have their judgement obscured by considerations of personal pleasure or pain. In general, then, the judge should, we say, be allowed to decide as few things as possible. But questions as to whether something has happened or has not happened, will be or will not be, is or is not, must of necessity be left to the judge, since the lawgiver cannot foresee them. If this is so, it is evident that any one who lays down rules about other matters, such as what must be the contents of the 'introduction' or the 'narration' or any of the other divisions of a speech, is theorizing about non-essentials as if they belonged to the art. The only question with which these writers here deal is how to put the judge into a given frame of mind. About the orator's proper modes of persuasion they have nothing to tell us; nothing, that is, about how to gain skill in enthymemes.

Hence it comes that, although the same systematic principles apply to political as to forensic oratory, and although the former is a nobler business, and fitter for a citizen, than that which concerns the relations of private individuals, these authors say nothing about political oratory, but try, one and all, to write treatises on the way to plead in court. The reason for this is that in political oratory there is less inducement to talk about nonessentials. Political oratory is less given to unscrupulous practices than forensic, because it treats of wider issues. In a political debate the man who is forming a judgement is making a decision about his own vital interests. There is no need, therefore, to prove anything except that the facts are what the supporter of a measure maintains they are. In forensic oratory this is not enough; to conciliate the listener is what pays here. It is other people's affairs that are to be decided, so that the judges, intent on their own satisfaction and listening with partiality, surrender themselves to the disputants instead of judging between them. Hence in many places, as we have said already, irrelevant speaking is forbidden in the law-courts: in the public assembly those who have to form a judgement are themselves well able to guard against that.

It is clear, then, that rhetorical study, in its strict sense, is concerned with the modes of persuasion. Persuasion is clearly a sort of demonstration, since we are most fully persuaded when we consider a thing to have been demonstrated. The orator's demonstration is an enthymeme, and this is, in general, the most effective of the modes of persuasion. The enthymeme is a sort of syllogism, and the consideration of syllogisms of all kinds, without distinction, is the business of dialectic, either of dialectic as a whole or of one of its branches. It follows plainly, therefore, that he who is best able to see how and from what elements a syllogism is produced will also be best skilled in the enthymeme, when he has further learnt what its subject-matter is and in what respects it differs from the syllogism of strict logic. The true and the approximately true are apprehended by the same faculty; it may also be noted that men have a sufficient natural instinct for what is true, and usually do arrive at the truth. Hence the man who makes a good guess at truth is likely to make a good guess at probabilities.

It has now been shown that the ordinary writers on rhetoric treat of non-essentials; it has also been shown why they have inclined more towards the forensic branch of oratory.

Rhetoric is useful (1) because things that are true and things that are just have a natural tendency to prevail over their opposites, so that if the decisions of judges are not what they ought to be, the defeat must be due to the speakers themselves, and they must be blamed accordingly. Moreover, (2) before some audiences not even the possession of the exactest knowledge will make it easy for what we say to produce conviction. For argument based on knowledge implies instruction, and there are people whom one cannot instruct. Here, then, we must use, as our modes of persuasion and argument, notions possessed by everybody, as we observed in the Topics when dealing with the way to handle a popular audience. Further, (3) we must be able to employ persuasion, just as strict reasoning can be employed, on opposite sides of a question, not in order that we may in practice employ it in both ways (for we must not make people believe what is wrong), but in order that we may see clearly what the facts are, and that, if another man argues unfairly, we on our part may be able to confute him. No other of the arts draws opposite conclusions: dialectic and rhetoric alone do this. Both these arts draw opposite conclusions impartially. Nevertheless, the underlying facts do not lend themselves equally well to the contrary views. No; things that are true and things that are better are, by their nature, practically always easier to prove and easier to believe in. Again, (4) it is absurd to hold that a man ought to be ashamed of being unable to defend himself with his limbs, but not of being unable to defend himself with speech and reason, when the use of rational speech is more distinctive of a human being than the use of his limbs. And if it be objected that one who uses such power of speech unjustly might do great harm, that is a charge which may be made in common against all good things except virtue, and above all against the things that are most useful, as strength, health, wealth, generalship. A man can confer the greatest of benefits by a right use of these, and inflict the greatest of injuries by using them wrongly.

It is clear, then, that rhetoric is not bound up with a single definite class of subjects, but is as universal as dialectic; it is clear, also, that it is useful. It is clear, further, that its function is not simply to succeed in persuading, but rather to discover the means of coming as near such success as the circumstances of each particular case allow. In this it resembles all other arts. For example, it is not the function of medicine simply to make a man quite healthy, but to put him as far as may be on the road to health; it is possible to give excellent treatment even to those who can never enjoy sound health. Furthermore, it is plain that it is the function of one and the same art to discern the real and the apparent means of persuasion, just as it is the function of dialectic to discern the real and the apparent syllogism. What makes a man a 'sophist' is not his faculty, but his moral purpose. In rhetoric, however, the term 'rhetorician' may describe either the speaker's knowledge of the art, or his moral purpose. In dialectic it is different: a man is a 'sophist' because he has a certain kind of moral purpose, a 'dialectician' in respect, not of his moral purpose, but of his faculty.

Let us now try to give some account of the systematic principles of Rhetoric itself – of the right method and means of succeeding in the object we set before us. We must make as it were a fresh start, and before going further define what rhetoric is.

2

Rhetoric may be defined as the faculty of observing in any given case the available means of persuasion. This is not a function of any other art. Every other art can instruct or persuade about its own particular subject-matter; for instance, medicine about what is healthy and unhealthy, geometry about the properties of magnitudes, arithmetic about numbers, and the same is true of the other arts and sciences. But rhetoric we look upon as the power of observing the means of persuasion on almost any subject presented to us; and that is why we

say that, in its technical character, it is not concerned with any special or definite class of subjects.

Of the modes of persuasion some belong strictly to the art of rhetoric and some do not. By the latter I mean such things as are not supplied by the speaker but are there at the outset-witnesses, evidence given under torture, written contracts, and so on. By the former I mean such as we can ourselves construct by means of the principles of rhetoric. The one kind has merely to be used, the other has to be invented.

Of the modes of persuasion furnished by the spoken word there are three kinds. The first kind depends on the personal character of the speaker; the second on putting the audience into a certain frame of mind; the third on the proof, or apparent proof, provided by the words of the speech itself. Persuasion is achieved by the speaker's personal character when the speech is so spoken as to make us think him credible. We believe good men more fully and more readily than others: this is true generally whatever the question is, and absolutely true where exact certainty is impossible and opinions are divided. This kind of persuasion, like the others, should be achieved by what the speaker says, not by what people think of his character before he begins to speak. It is not true, as some writers assume in their treatises on rhetoric, that the personal goodness revealed by the speaker contributes nothing to his power of persuasion; on the contrary, his character may almost be called the most effective means of persuasion he possesses. Secondly, persuasion may come through the hearers, when the speech stirs their emotions. Our judgements when we are pleased and friendly are not the same as when we are pained and hostile. It is towards producing these effects, as we maintain, that present-day writers on rhetoric direct the whole of their efforts. This subject shall be treated in detail when we come to speak of the emotions. Thirdly, persuasion is effected through the speech itself when we have proved a truth or an apparent truth by means of the persuasive arguments suitable to the case in question.

There are, then, these three means of effecting persuasion. The man who is to be in command of them must, it is clear, be able (1) to

reason logically, (2) to understand human character and goodness in their various forms, and (3) to understand the emotions – that is, to name them and describe them, to know their causes and the way in which they are excited. It thus appears that rhetoric is an offshoot of dialectic and also of ethical studies. Ethical studies may fairly be called political; and for this reason rhetoric masquerades as political science, and the professors of it as political experts – sometimes from want of education, sometimes from ostentation, sometimes owing to other human failings. As a matter of fact, it is a branch of dialectic and similar to it, as we said at the outset. Neither rhetoric nor dialectic is the scientific study of any one separate subject: both are faculties for providing arguments. This is perhaps a sufficient account of their scope and of how they are related to each other.

With regard to the persuasion achieved by proof or apparent proof: just as in dialectic there is induction on the one hand and syllogism or apparent syllogism on the other, so it is in rhetoric. The example is an induction, the enthymeme is a syllogism, and the apparent enthymeme is an apparent syllogism. I call the enthymeme a rhetorical syllogism, and the example a rhetorical induction. Every one who effects persuasion through proof does in fact use either enthymemes or examples: there is no other way. And since every one who proves anything at all is bound to use either syllogisms or inductions (and this is clear to us from the Analytics), it must follow that enthymemes are syllogisms and examples are inductions. The difference between example and enthymeme is made plain by the passages in the Topics where induction and syllogism have already been discussed. When we base the proof of a proposition on a number of similar cases, this is induction in dialectic, example in rhetoric; when it is shown that, certain propositions being true, a further and quite distinct proposition must also be true in consequence, whether invariably or usually, this is called syllogism in dialectic, enthymeme in rhetoric. It is plain also that each of these types of oratory has its advantages. Types of oratory, I say: for what has been said in the Methodics applies equally well here; in some oratorical styles examples prevail, in others enthymemes; and in like manner, some orators are better at the former and some at the latter. Speeches that rely on examples are as persuasive as the other kind,

but those which rely on enthymemes excite the louder applause. The sources of examples and enthymemes, and their proper uses, we will discuss later. Our next step is to define the processes themselves more clearly.

A statement is persuasive and credible either because it is directly self-evident or because it appears to be proved from other statements that are so. In either case it is persuasive because there is somebody whom it persuades. But none of the arts theorize about individual cases. Medicine, for instance, does not theorize about what will help to cure Socrates or Callias, but only about what will help to cure any or all of a given class of patients: this alone is business: individual cases are so infinitely various that no systematic knowledge of them is possible. In the same way the theory of rhetoric is concerned not with what seems probable to a given individual like Socrates or Hippias, but with what seems probable to men of a given type; and this is true of dialectic also. Dialectic does not construct its syllogisms out of any haphazard materials, such as the fancies of crazy people, but out of materials that call for discussion; and rhetoric, too, draws upon the regular subjects of debate. The duty of rhetoric is to deal with such matters as we deliberate upon without arts or systems to guide us, in the hearing of persons who cannot take in at a glance a complicated argument, or follow a long chain of reasoning. The subjects of our deliberation are such as seem to present us with alternative possibilities: about things that could not have been, and cannot now or in the future be, other than they are, nobody who takes them to be of this nature wastes his time in deliberation.

It is possible to form syllogisms and draw conclusions from the results of previous syllogisms; or, on the other hand, from premisses which have not been thus proved, and at the same time are so little accepted that they call for proof. Reasonings of the former kind will necessarily be hard to follow owing to their length, for we assume an audience of untrained thinkers; those of the latter kind will fail to win assent, because they are based on premisses that are not generally admitted or believed.

The enthymeme and the example must, then, deal with what is in the main contingent, the example being an induction, and the enthymeme a syllogism, about such matters. The enthymeme must consist of few propositions, fewer often than those which make up the normal syllogism. For if any of these propositions is a familiar fact, there is no need even to mention it; the hearer adds it himself. Thus, to show that Dorieus has been victor in a contest for which the prize is a crown, it is enough to say 'For he has been victor in the Olympic games', without adding 'And in the Olympic games the prize is a crown', a fact which everybody knows.

There are few facts of the 'necessary' type that can form the basis of rhetorical syllogisms. Most of the things about which we make decisions, and into which therefore we inquire, present us with alternative possibilities. For it is about our actions that we deliberate and inquire, and all our actions have a contingent character; hardly any of them are determined by necessity. Again, conclusions that state what is merely usual or possible must be drawn from premisses that do the same, just as 'necessary' conclusions must be drawn from 'necessary' premisses; this too is clear to us from the Analytics. It is evident, therefore, that the propositions forming the basis of enthymemes, though some of them may be 'necessary', will most of them be only usually true. Now the materials of enthymemes are Probabilities and Signs, which we can see must correspond respectively with the propositions that are generally and those that are necessarily true. A Probability is a thing that usually happens; not, however, as some definitions would suggest, anything whatever that usually happens, but only if it belongs to the class of the 'contingent' or 'variable'. It bears the same relation to that in respect of which it is probable as the universal bears to the particular. Of Signs, one kind bears the same relation to the statement it supports as the particular bears to the universal, the other the same as the universal bears to the particular. The infallible kind is a 'complete proof' (tekmerhiou); the fallible kind has no specific name. By infallible signs I mean those on which syllogisms proper may be based: and this shows us why this kind of Sign is called 'complete proof': when people think that what they have said cannot be refuted, they then think that they are bringing forward a 'complete proof', meaning that the matter has

now been demonstrated and completed (peperhasmeuou); for the word ‘perhas’ has the same meaning (of ‘end’ or ‘boundary’) as the word ‘tekmarh’ in the ancient tongue. Now the one kind of Sign (that which bears to the proposition it supports the relation of particular to universal) may be illustrated thus. Suppose it were said, ‘The fact that Socrates was wise and just is a sign that the wise are just’. Here we certainly have a Sign; but even though the proposition be true, the argument is refutable, since it does not form a syllogism. Suppose, on the other hand, it were said, ‘The fact that he has a fever is a sign that he is ill’, or, ‘The fact that she is giving milk is a sign that she has lately borne a child’. Here we have the infallible kind of Sign, the only kind that constitutes a complete proof, since it is the only kind that, if the particular statement is true, is irrefutable. The other kind of Sign, that which bears to the proposition it supports the relation of universal to particular, might be illustrated by saying, ‘The fact that he breathes fast is a sign that he has a fever’. This argument also is refutable, even if the statement about the fast breathing be true, since a man may breathe hard without having a fever.

It has, then, been stated above what is the nature of a Probability, of a Sign, and of a complete proof, and what are the differences between them. In the Analytics a more explicit description has been given of these points; it is there shown why some of these reasonings can be put into syllogisms and some cannot.

The ‘example’ has already been described as one kind of induction; and the special nature of the subject-matter that distinguishes it from the other kinds has also been stated above. Its relation to the proposition it supports is not that of part to whole, nor whole to part, nor whole to whole, but of part to part, or like to like. When two statements are of the same order, but one is more familiar than the other, the former is an ‘example’. The argument may, for instance, be that Dionysius, in asking as he does for a bodyguard, is scheming to make himself a despot. For in the past Peisistratus kept asking for a bodyguard in order to carry out such a scheme, and did make himself a despot as soon as he got it; and so did Theagenes at Megara; and in the same way all other instances known to the speaker are made into examples, in order to show what is not yet known, that Dionysius has

the same purpose in making the same request: all these being instances of the one general principle, that a man who asks for a bodyguard is scheming to make himself a despot. We have now described the sources of those means of persuasion which are popularly supposed to be demonstrative.

There is an important distinction between two sorts of enthymemes that has been wholly overlooked by almost everybody – one that also subsists between the syllogisms treated of in dialectic. One sort of enthymeme really belongs to rhetoric, as one sort of syllogism really belongs to dialectic; but the other sort really belongs to other arts and faculties, whether to those we already exercise or to those we have not yet acquired. Missing this distinction, people fail to notice that the more correctly they handle their particular subject the further they are getting away from pure rhetoric or dialectic. This statement will be clearer if expressed more fully. I mean that the proper subjects of dialectical and rhetorical syllogisms are the things with which we say the regular or universal Lines of Argument are concerned, that is to say those lines of argument that apply equally to questions of right conduct, natural science, politics, and many other things that have nothing to do with one another. Take, for instance, the line of argument concerned with 'the more or less'. On this line of argument it is equally easy to base a syllogism or enthymeme about any of what nevertheless are essentially disconnected subjects – right conduct, natural science, or anything else whatever. But there are also those special Lines of Argument which are based on such propositions as apply only to particular groups or classes of things. Thus there are propositions about natural science on which it is impossible to base any enthymeme or syllogism about ethics, and other propositions about ethics on which nothing can be based about natural science. The same principle applies throughout. The general Lines of Argument have no special subject-matter, and therefore will not increase our understanding of any particular class of things. On the other hand, the better the selection one makes of propositions suitable for special Lines of Argument, the nearer one comes, unconsciously, to setting up a science that is distinct from dialectic and rhetoric. One may succeed in stating the required principles, but one's science will be no longer

dialectic or rhetoric, but the science to which the principles thus discovered belong. Most enthymemes are in fact based upon these particular or special Lines of Argument; comparatively few on the common or general kind. As in the therefore, so in this work, we must distinguish, in dealing with enthymemes, the special and the general Lines of Argument on which they are to be founded. By special Lines of Argument I mean the propositions peculiar to each several class of things, by general those common to all classes alike. We may begin with the special Lines of Argument. But, first of all, let us classify rhetoric into its varieties. Having distinguished these we may deal with them one by one, and try to discover the elements of which each is composed, and the propositions each must employ.

3

Rhetoric falls into three divisions, determined by the three classes of listeners to speeches. For of the three elements in speech-making – speaker, subject, and person addressed – it is the last one, the hearer, that determines the speech's end and object. The hearer must be either a judge, with a decision to make about things past or future, or an observer. A member of the assembly decides about future events, a juryman about past events: while those who merely decide on the orator's skill are observers. From this it follows that there are three divisions of oratory – (1) political, (2) forensic, and (3) the ceremonial oratory of display.

Political speaking urges us either to do or not to do something: one of these two courses is always taken by private counsellors, as well as by men who address public assemblies. Forensic speaking either attacks or defends somebody: one or other of these two things must always be done by the parties in a case. The ceremonial oratory of display either praises or censures somebody. These three kinds of rhetoric refer to three different kinds of time. The political orator is concerned with the future: it is about things to be done hereafter that he advises, for or against. The party in a case at law is concerned with

the past; one man accuses the other, and the other defends himself, with reference to things already done. The ceremonial orator is, properly speaking, concerned with the present, since all men praise or blame in view of the state of things existing at the time, though they often find it useful also to recall the past and to make guesses at the future.

Rhetoric has three distinct ends in view, one for each of its three kinds. The political orator aims at establishing the expediency or the harmfulness of a proposed course of action; if he urges its acceptance, he does so on the ground that it will do good; if he urges its rejection, he does so on the ground that it will do harm; and all other points, such as whether the proposal is just or unjust, honourable or dishonourable, he brings in as subsidiary and relative to this main consideration. Parties in a law-case aim at establishing the justice or injustice of some action, and they too bring in all other points as subsidiary and relative to this one. Those who praise or attack a man aim at proving him worthy of honour or the reverse, and they too treat all other considerations with reference to this one.

That the three kinds of rhetoric do aim respectively at the three ends we have mentioned is shown by the fact that speakers will sometimes not try to establish anything else. Thus, the litigant will sometimes not deny that a thing has happened or that he has done harm. But that he is guilty of injustice he will never admit; otherwise there would be no need of a trial. So too, political orators often make any concession short of admitting that they are recommending their hearers to take an inexpedient course or not to take an expedient one. The question whether it is not unjust for a city to enslave its innocent neighbours often does not trouble them at all. In like manner those who praise or censure a man do not consider whether his acts have been expedient or not, but often make it a ground of actual praise that he has neglected his own interest to do what was honourable. Thus, they praise Achilles because he championed his fallen friend Patroclus, though he knew that this meant death, and that otherwise he need not die: yet while to die thus was the nobler thing for him to do, the expedient thing was to live on.

It is evident from what has been said that it is these three subjects, more than any others, about which the orator must be able to have propositions at his command. Now the propositions of Rhetoric are Complete Proofs, Probabilities, and Signs. Every kind of syllogism is composed of propositions, and the enthymeme is a particular kind of syllogism composed of the aforesaid propositions.

Since only possible actions, and not impossible ones, can ever have been done in the past or the present, and since things which have not occurred, or will not occur, also cannot have been done or be going to be done, it is necessary for the political, the forensic, and the ceremonial speaker alike to be able to have at their command propositions about the possible and the impossible, and about whether a thing has or has not occurred, will or will not occur. Further, all men, in giving praise or blame, in urging us to accept or reject proposals for action, in accusing others or defending themselves, attempt not only to prove the points mentioned but also to show that the good or the harm, the honour or disgrace, the justice or injustice, is great or small, either absolutely or relatively; and therefore it is plain that we must also have at our command propositions about greatness or smallness and the greater or the lesser – propositions both universal and particular. Thus, we must be able to say which is the greater or lesser good, the greater or lesser act of justice or injustice; and so on.

Such, then, are the subjects regarding which we are inevitably bound to master the propositions relevant to them. We must now discuss each particular class of these subjects in turn, namely those dealt with in political, in ceremonial, and lastly in legal, oratory.

4

First, then, we must ascertain what are the kinds of things, good or bad, about which the political orator offers counsel. For he does not deal with all things, but only with such as may or may not take place.

Concerning things which exist or will exist inevitably, or which cannot possibly exist or take place, no counsel can be given. Nor, again, can counsel be given about the whole class of things which may or may not take place; for this class includes some good things that occur naturally, and some that occur by accident; and about these it is useless to offer counsel. Clearly counsel can only be given on matters about which people deliberate; matters, namely, that ultimately depend on ourselves, and which we have it in our power to set going. For we turn a thing over in our mind until we have reached the point of seeing whether we can do it or not.

Now to enumerate and classify accurately the usual subjects of public business, and further to frame, as far as possible, true definitions of them is a task which we must not attempt on the present occasion. For it does not belong to the art of rhetoric, but to a more instructive art and a more real branch of knowledge; and as it is, rhetoric has been given a far wider subject-matter than strictly belongs to it. The truth is, as indeed we have said already, that rhetoric is a combination of the science of logic and of the ethical branch of politics; and it is partly like dialectic, partly like sophistical reasoning. But the more we try to make either dialectic rhetoric not, what they really are, practical faculties, but sciences, the more we shall inadvertently be destroying their true nature; for we shall be re-fashioning them and shall be passing into the region of sciences dealing with definite subjects rather than simply with words and forms of reasoning. Even here, however, we will mention those points which it is of practical importance to distinguish, their fuller treatment falling naturally to political science.

The main matters on which all men deliberate and on which political speakers make speeches are some five in number: ways and means, war and peace, national defence, imports and exports, and legislation.

As to Ways and Means, then, the intending speaker will need to know the number and extent of the country's sources of revenue, so that, if any is being overlooked, it may be added, and, if any is defective, it may be increased. Further, he should know all the expenditure of the

country, in order that, if any part of it is superfluous, it may be abolished, or, if any is too large, it may be reduced. For men become richer not only by increasing their existing wealth but also by reducing their expenditure. A comprehensive view of these questions cannot be gained solely from experience in home affairs; in order to advise on such matters a man must be keenly interested in the methods worked out in other lands.

As to Peace and War, he must know the extent of the military strength of his country, both actual and potential, and also the mature of that actual and potential strength; and further, what wars his country has waged, and how it has waged them. He must know these facts not only about his own country, but also about neighbouring countries; and also about countries with which war is likely, in order that peace may be maintained with those stronger than his own, and that his own may have power to make war or not against those that are weaker. He should know, too, whether the military power of another country is like or unlike that of his own; for this is a matter that may affect their relative strength. With the same end in view he must, besides, have studied the wars of other countries as well as those of his own, and the way they ended; similar causes are likely to have similar results.

With regard to National Defence: he ought to know all about the methods of defence in actual use, such as the strength and character of the defensive force and the positions of the forts – this last means that he must be well acquainted with the lie of the country – in order that a garrison may be increased if it is too small or removed if it is not wanted, and that the strategic points may be guarded with special care.

With regard to the Food Supply: he must know what outlay will meet the needs of his country; what kinds of food are produced at home and what imported; and what articles must be exported or imported. This last he must know in order that agreements and commercial treaties may be made with the countries concerned. There are, indeed, two sorts of state to which he must see that his countrymen

give no cause for offence, states stronger than his own, and states with which it is advantageous to trade.

But while he must, for security's sake, be able to take all this into account, he must before all things understand the subject of legislation; for it is on a country's laws that its whole welfare depends. He must, therefore, know how many different forms of constitution there are; under what conditions each of these will prosper and by what internal developments or external attacks each of them tends to be destroyed. When I speak of destruction through internal developments I refer to the fact that all constitutions, except the best one of all, are destroyed both by not being pushed far enough and by being pushed too far. Thus, democracy loses its vigour, and finally passes into oligarchy, not only when it is not pushed far enough, but also when it is pushed a great deal too far; just as the aquiline and the snub nose not only turn into normal noses by not being aquiline or snub enough, but also by being too violently aquiline or snub arrive at a condition in which they no longer look like noses at all. It is useful, in framing laws, not only to study the past history of one's own country, in order to understand which constitution is desirable for it now, but also to have a knowledge of the constitutions of other nations, and so to learn for what kinds of nation the various kinds of constitution are suited. From this we can see that books of travel are useful aids to legislation, since from these we may learn the laws and customs of different races. The political speaker will also find the researches of historians useful. But all this is the business of political science and not of rhetoric.

These, then, are the most important kinds of information which the political speaker must possess. Let us now go back and state the premisses from which he will have to argue in favour of adopting or rejecting measures regarding these and other matters.

5

It may be said that every individual man and all men in common aim at a certain end which determines what they choose and what they avoid. This end, to sum it up briefly, is happiness and its constituents. Let us, then, by way of illustration only, ascertain what is in general the nature of happiness, and what are the elements of its constituent parts. For all advice to do things or not to do them is concerned with happiness and with the things that make for or against it; whatever creates or increases happiness or some part of happiness, we ought to do; whatever destroys or hampers happiness, or gives rise to its opposite, we ought not to do.

We may define happiness as prosperity combined with virtue; or as independence of life; or as the secure enjoyment of the maximum of pleasure; or as a good condition of property and body, together with the power of guarding one's property and body and making use of them. That happiness is one or more of these things, pretty well everybody agrees.

From this definition of happiness it follows that its constituent parts are: – good birth, plenty of friends, good friends, wealth, good children, plenty of children, a happy old age, also such bodily excellences as health, beauty, strength, large stature, athletic powers, together with fame, honour, good luck, and virtue. A man cannot fail to be completely independent if he possesses these internal and these external goods; for besides these there are no others to have. (Goods of the soul and of the body are internal. Good birth, friends, money, and honour are external.) Further, we think that he should possess resources and luck, in order to make his life really secure. As we have already ascertained what happiness in general is, so now let us try to ascertain what of these parts of it is.

Now good birth in a race or a state means that its members are indigenous or ancient: that its earliest leaders were distinguished men, and that from them have sprung many who were distinguished for qualities that we admire.

The good birth of an individual, which may come either from the male or the female side, implies that both parents are free citizens, and that, as in the case of the state, the founders of the line have been notable for virtue or wealth or something else which is highly prized, and that many distinguished persons belong to the family, men and women, young and old.

The phrases ‘possession of good children’ and ‘of many children’ bear a quite clear meaning. Applied to a community, they mean that its young men are numerous and of good a quality: good in regard to bodily excellences, such as stature, beauty, strength, athletic powers; and also in regard to the excellences of the soul, which in a young man are temperance and courage. Applied to an individual, they mean that his own children are numerous and have the good qualities we have described. Both male and female are here included; the excellences of the latter are, in body, beauty and stature; in soul, self-command and an industry that is not sordid. Communities as well as individuals should lack none of these perfections, in their women as well as in their men. Where, as among the Lacedaemonians, the state of women is bad, almost half of human life is spoilt.

The constituents of wealth are: plenty of coined money and territory; the ownership of numerous, large, and beautiful estates; also the ownership of numerous and beautiful implements, live stock, and slaves. All these kinds of property are our own, are secure, gentlemanly, and useful. The useful kinds are those that are productive, the gentlemanly kinds are those that provide enjoyment. By ‘productive’ I mean those from which we get our income; by ‘enjoyable’, those from which we get nothing worth mentioning except the use of them. The criterion of ‘security’ is the ownership of property in such places and under such Conditions that the use of it is in our power; and it is ‘our own’ if it is in our own power to dispose of it or keep it. By ‘disposing of it’ I mean giving it away or selling it. Wealth as a whole consists in using things rather than in owning them; it is really the activity – that is, the use – of property that constitutes wealth.

Fame means being respected by everybody, or having some quality that is desired by all men, or by most, or by the good, or by the wise.

Honour is the token of a man's being famous for doing good. it is chiefly and most properly paid to those who have already done good; but also to the man who can do good in future. Doing good refers either to the preservation of life and the means of life, or to wealth, or to some other of the good things which it is hard to get either always or at that particular place or time – for many gain honour for things which seem small, but the place and the occasion account for it. The constituents of honour are: sacrifices; commemoration, in verse or prose; privileges; grants of land; front seats at civic celebrations; state burial; statues; public maintenance; among foreigners, obeisances and giving place; and such presents as are among various bodies of men regarded as marks of honour. For a present is not only the bestowal of a piece of property, but also a token of honour; which explains why honour-loving as well as money-loving persons desire it. The present brings to both what they want; it is a piece of property, which is what the lovers of money desire; and it brings honour, which is what the lovers of honour desire.

The excellence of the body is health; that is, a condition which allows us, while keeping free from disease, to have the use of our bodies; for many people are 'healthy' as we are told Herodicus was; and these no one can congratulate on their 'health', for they have to abstain from everything or nearly everything that men do. – Beauty varies with the time of life. In a young man beauty is the possession of a body fit to endure the exertion of running and of contests of strength; which means that he is pleasant to look at; and therefore all-round athletes are the most beautiful, being naturally adapted both for contests of strength and for speed also. For a man in his prime, beauty is fitness for the exertion of warfare, together with a pleasant but at the same time formidable appearance. For an old man, it is to be strong enough for such exertion as is necessary, and to be free from all those deformities of old age which cause pain to others. Strength is the power of moving some one else at will; to do this, you must either pull, push, lift, pin, or grip him; thus you must be strong in all of

those ways or at least in some. Excellence in size is to surpass ordinary people in height, thickness, and breadth by just as much as will not make one's movements slower in consequence. Athletic excellence of the body consists in size, strength, and swiftness; swiftness implying strength. He who can fling forward his legs in a certain way, and move them fast and far, is good at running; he who can grip and hold down is good at wrestling; he who can drive an adversary from his ground with the right blow is a good boxer: he who can do both the last is a good pancratiast, while he who can do all is an 'all-round' athlete.

Happiness in old age is the coming of old age slowly and painlessly; for a man has not this happiness if he grows old either quickly, or tardily but painfully. It arises both from the excellences of the body and from good luck. If a man is not free from disease, or if he is strong, he will not be free from suffering; nor can he continue to live a long and painless life unless he has good luck. There is, indeed, a capacity for long life that is quite independent of health or strength; for many people live long who lack the excellences of the body; but for our present purpose there is no use in going into the details of this.

The terms 'possession of many friends' and 'possession of good friends' need no explanation; for we define a 'friend' as one who will always try, for your sake, to do what he takes to be good for you. The man towards whom many feel thus has many friends; if these are worthy men, he has good friends.

'Good luck' means the acquisition or possession of all or most, or the most important, of those good things which are due to luck. Some of the things that are due to luck may also be due to artificial contrivance; but many are independent of art, as for example those which are due to nature – though, to be sure, things due to luck may actually be contrary to nature. Thus health may be due to artificial contrivance, but beauty and stature are due to nature. All such good things as excite envy are, as a class, the outcome of good luck. Luck is also the cause of good things that happen contrary to reasonable expectation: as when, for instance, all your brothers are ugly, but you

are handsome yourself; or when you find a treasure that everybody else has overlooked; or when a missile hits the next man and misses you; or when you are the only man not to go to a place you have gone to regularly, while the others go there for the first time and are killed. All such things are reckoned pieces of good luck.

As to virtue, it is most closely connected with the subject of Eulogy, and therefore we will wait to define it until we come to discuss that subject.

6

It is now plain what our aims, future or actual, should be in urging, and what in depreciating, a proposal; the latter being the opposite of the former. Now the political or deliberative orator's aim is utility: deliberation seeks to determine not ends but the means to ends, i.e. what it is most useful to do. Further, utility is a good thing. We ought therefore to assure ourselves of the main facts about Goodness and Utility in general.

We may define a good thing as that which ought to be chosen for its own sake; or as that for the sake of which we choose something else; or as that which is sought after by all things, or by all things that have sensation or reason, or which will be sought after by any things that acquire reason; or as that which must be prescribed for a given individual by reason generally, or is prescribed for him by his individual reason, this being his individual good; or as that whose presence brings anything into a satisfactory and self-sufficing condition; or as self-sufficiency; or as what produces, maintains, or entails characteristics of this kind, while preventing and destroying their opposites. One thing may entail another in either of two ways – (1) simultaneously, (2) subsequently. Thus learning entails knowledge subsequently, health entails life simultaneously. Things are productive of other things in three senses: first as being healthy produces health; secondly, as food produces health; and thirdly, as

exercise does – i.e. it does so usually. All this being settled, we now see that both the acquisition of good things and the removal of bad things must be good; the latter entails freedom from the evil things simultaneously, while the former entails possession of the good things subsequently. The acquisition of a greater in place of a lesser good, or of a lesser in place of a greater evil, is also good, for in proportion as the greater exceeds the lesser there is acquisition of good or removal of evil. The virtues, too, must be something good; for it is by possessing these that we are in a good condition, and they tend to produce good works and good actions. They must be severally named and described elsewhere. Pleasure, again, must be a good thing, since it is the nature of all animals to aim at it. Consequently both pleasant and beautiful things must be good things, since the former are productive of pleasure, while of the beautiful things some are pleasant and some desirable in and for themselves.

The following is a more detailed list of things that must be good. Happiness, as being desirable in itself and sufficient by itself, and as being that for whose sake we choose many other things. Also justice, courage, temperance, magnanimity, magnificence, and all such qualities, as being excellences of the soul. Further, health, beauty, and the like, as being bodily excellences and productive of many other good things: for instance, health is productive both of pleasure and of life, and therefore is thought the greatest of goods, since these two things which it causes, pleasure and life, are two of the things most highly prized by ordinary people. Wealth, again: for it is the excellence of possession, and also productive of many other good things. Friends and friendship: for a friend is desirable in himself and also productive of many other good things. So, too, honour and reputation, as being pleasant, and productive of many other good things, and usually accompanied by the presence of the good things that cause them to be bestowed. The faculty of speech and action; since all such qualities are productive of what is good. Further – good parts, strong memory, receptiveness, quickness of intuition, and the like, for all such faculties are productive of what is good. Similarly, all the sciences and arts. And life: since, even if no other good were the result of life, it is desirable in itself. And justice, as the cause of good to the community.

The above are pretty well all the things admittedly good. In dealing with things whose goodness is disputed, we may argue in the following ways: – That is good of which the contrary is bad. That is good the contrary of which is to the advantage of our enemies; for example, if it is to the particular advantage of our enemies that we should be cowards, clearly courage is of particular value to our countrymen. And generally, the contrary of that which our enemies desire, or of that at which they rejoice, is evidently valuable. Hence the passage beginning:

Surely would Priam exult.

This principle usually holds good, but not always, since it may well be that our interest is sometimes the same as that of our enemies. Hence it is said that 'evils draw men together'; that is, when the same thing is hurtful to them both.

Further: that which is not in excess is good, and that which is greater than it should be is bad. That also is good on which much labour or money has been spent; the mere fact of this makes it seem good, and such a good is assumed to be an end – an end reached through a long chain of means; and any end is a good. Hence the lines beginning:

And for Priam (and Troy-town's folk) should they leave behind them a boast;

and

Oh, it were shame

To have tarried so long and return empty-handed as erst we came;

and there is also the proverb about 'breaking the pitcher at the door'.

That which most people seek after, and which is obviously an object of contention, is also a good; for, as has been shown, that is good which is sought after by everybody, and 'most people' is taken to be equivalent to 'everybody'. That which is praised is good, since no one praises what is not good. So, again, that which is praised by our enemies [or by the worthless] for when even those who have a

grievance think a thing good, it is at once felt that every one must agree with them; our enemies can admit the fact only because it is evident, just as those must be worthless whom their friends censure and their enemies do not. (For this reason the Corinthians conceived themselves to be insulted by Simonides when he wrote:

Against the Corinthians hath Ilium no complaint.)

Again, that is good which has been distinguished by the favour of a discerning or virtuous man or woman, as Odysseus was distinguished by Athena, Helen by Theseus, Paris by the goddesses, and Achilles by Homer. And, generally speaking, all things are good which men deliberately choose to do; this will include the things already mentioned, and also whatever may be bad for their enemies or good for their friends, and at the same time practicable. Things are 'practicable' in two senses: (1) it is possible to do them, (2) it is easy to do them. Things are done 'easily' when they are done either without pain or quickly: the 'difficulty' of an act lies either in its painfulness or in the long time it takes. Again, a thing is good if it is as men wish; and they wish to have either no evil at an or at least a balance of good over evil. This last will happen where the penalty is either imperceptible or slight. Good, too, are things that are a man's very own, possessed by no one else, exceptional; for this increases the credit of having them. So are things which befit the possessors, such as whatever is appropriate to their birth or capacity, and whatever they feel they ought to have but lack – such things may indeed be trifling, but none the less men deliberately make them the goal of their action. And things easily effected; for these are practicable (in the sense of being easy); such things are those in which every one, or most people, or one's equals, or one's inferiors have succeeded. Good also are the things by which we shall gratify our friends or annoy our enemies; and the things chosen by those whom we admire: and the things for which we are fitted by nature or experience, since we think we shall succeed more easily in these: and those in which no worthless man can succeed, for such things bring greater praise: and those which we do in fact desire, for what we desire is taken to be not only pleasant but also better. Further, a man of a given disposition makes chiefly for the corresponding things: lovers of victory make for

victory, lovers of honour for honour, money-loving men for money, and so with the rest. These, then, are the sources from which we must derive our means of persuasion about Good and Utility.

7

Since, however, it often happens that people agree that two things are both useful but do not agree about which is the more so, the next step will be to treat of relative goodness and relative utility.

A thing which surpasses another may be regarded as being that other thing plus something more, and that other thing which is surpassed as being what is contained in the first thing. Now to call a thing 'greater' or 'more' always implies a comparison of it with one that is 'smaller' or 'less', while 'great' and 'small', 'much' and 'little', are terms used in comparison with normal magnitude. The 'great' is that which surpasses the normal, the 'small' is that which is surpassed by the normal; and so with 'many' and 'few'.

Now we are applying the term 'good' to what is desirable for its own sake and not for the sake of something else; to that at which all things aim; to what they would choose if they could acquire understanding and practical wisdom; and to that which tends to produce or preserve such goods, or is always accompanied by them. Moreover, that for the sake of which things are done is the end (an end being that for the sake of which all else is done), and for each individual that thing is a good which fulfils these conditions in regard to himself. It follows, then, that a greater number of goods is a greater good than one or than a smaller number, if that one or that smaller number is included in the count; for then the larger number surpasses the smaller, and the smaller quantity is surpassed as being contained in the larger.

Again, if the largest member of one class surpasses the largest member of another, then the one class surpasses the other; and if

one class surpasses another, then the largest member of the one surpasses the largest member of the other. Thus, if the tallest man is taller than the tallest woman, then men in general are taller than women. Conversely, if men in general are taller than women, then the tallest man is taller than the tallest woman. For the superiority of class over class is proportionate to the superiority possessed by their largest specimens. Again, where one good is always accompanied by another, but does not always accompany it, it is greater than the other, for the use of the second thing is implied in the use of the first. A thing may be accompanied by another in three ways, either simultaneously, subsequently, or potentially. Life accompanies health simultaneously (but not health life), knowledge accompanies the act of learning subsequently, cheating accompanies sacrilege potentially, since a man who has committed sacrilege is always capable of cheating. Again, when two things each surpass a third, that which does so by the greater amount is the greater of the two; for it must surpass the greater as well as the less of the other two. A thing productive of a greater good than another is productive of is itself a greater good than that other. For this conception of 'productive of a greater' has been implied in our argument. Likewise, that which is produced by a greater good is itself a greater good; thus, if what is wholesome is more desirable and a greater good than what gives pleasure, health too must be a greater good than pleasure. Again, a thing which is desirable in itself is a greater good than a thing which is not desirable in itself, as for example bodily strength than what is wholesome, since the latter is not pursued for its own sake, whereas the former is; and this was our definition of the good. Again, if one of two things is an end, and the other is not, the former is the greater good, as being chosen for its own sake and not for the sake of something else; as, for example, exercise is chosen for the sake of physical well-being. And of two things that which stands less in need of the other, or of other things, is the greater good, since it is more self-sufficing. (That which stands 'less' in need of others is that which needs either fewer or easier things.) So when one thing does not exist or cannot come into existence without a second, while the second can exist without the first, the second is the better. That which does not need something else is more self-sufficing than that

which does, and presents itself as a greater good for that reason. Again, that which is a beginning of other things is a greater good than that which is not, and that which is a cause is a greater good than that which is not; the reason being the same in each case, namely that without a cause and a beginning nothing can exist or come into existence. Again, where there are two sets of consequences arising from two different beginnings or causes, the consequences of the more important beginning or cause are themselves the more important; and conversely, that beginning or cause is itself the more important which has the more important consequences. Now it is plain, from all that has been said, that one thing may be shown to be more important than another from two opposite points of view: it may appear the more important (1) because it is a beginning and the other thing is not, and also (2) because it is not a beginning and the other thing is – on the ground that the end is more important and is not a beginning. So Leodamas, when accusing Callistratus, said that the man who prompted the deed was more guilty than the doer, since it would not have been done if he had not planned it. On the other hand, when accusing Chabrias he said that the doer was worse than the prompter, since there would have been no deed without some one to do it; men, said he, plot a thing only in order to carry it out.

Further, what is rare is a greater good than what is plentiful. Thus, gold is a better thing than iron, though less useful: it is harder to get, and therefore better worth getting. Reversely, it may be argued that the plentiful is a better thing than the rare, because we can make more use of it. For what is often useful surpasses what is seldom useful, whence the saying:

The best of things is water.

More generally: the hard thing is better than the easy, because it is rarer: and reversely, the easy thing is better than the hard, for it is as we wish it to be. That is the greater good whose contrary is the greater evil, and whose loss affects us more. Positive goodness and badness are more important than the mere absence of goodness and badness: for positive goodness and badness are ends, which the mere

absence of them cannot be. Further, in proportion as the functions of things are noble or base, the things themselves are good or bad: conversely, in proportion as the things themselves are good or bad, their functions also are good or bad; for the nature of results corresponds with that of their causes and beginnings, and conversely the nature of causes and beginnings corresponds with that of their results. Moreover, those things are greater goods, superiority in which is more desirable or more honourable. Thus, keenness of sight is more desirable than keenness of smell, sight generally being more desirable than smell generally; and similarly, unusually great love of friends being more honourable than unusually great love of money, ordinary love of friends is more honourable than ordinary love of money. Conversely, if one of two normal things is better or nobler than the other, an unusual degree of that thing is better or nobler than an unusual degree of the other. Again, one thing is more honourable or better than another if it is more honourable or better to desire it; the importance of the object of a given instinct corresponds to the importance of the instinct itself; and for the same reason, if one thing is more honourable or better than another, it is more honourable and better to desire it. Again, if one science is more honourable and valuable than another, the activity with which it deals is also more honourable and valuable; as is the science, so is the reality that is its object, each science being authoritative in its own sphere. So, also, the more valuable and honourable the object of a science, the more valuable and honourable the science itself is – in consequence. Again, that which would be judged, or which has been judged, a good thing, or a better thing than something else, by all or most people of understanding, or by the majority of men, or by the ablest, must be so; either without qualification, or in so far as they use their understanding to form their judgement. This is indeed a general principle, applicable to all other judgements also; not only the goodness of things, but their essence, magnitude, and general nature are in fact just what knowledge and understanding will declare them to be. Here the principle is applied to judgements of goodness, since one definition of 'good' was 'what beings that acquire understanding will choose in any given case': from which it clearly follows that that thing is hetter which understanding declares to be

so. That, again, is a better thing which attaches to better men, either absolutely, or in virtue of their being better; as courage is better than strength. And that is a greater good which would be chosen by a better man, either absolutely, or in virtue of his being better: for instance, to suffer wrong rather than to do wrong, for that would be the choice of the juster man. Again, the pleasanter of two things is the better, since all things pursue pleasure, and things instinctively desire pleasurable sensation for its own sake; and these are two of the characteristics by which the 'good' and the 'end' have been defined. One pleasure is greater than another if it is more unmixed with pain, or more lasting. Again, the nobler thing is better than the less noble, since the noble is either what is pleasant or what is desirable in itself. And those things also are greater goods which men desire more earnestly to bring about for themselves or for their friends, whereas those things which they least desire to bring about are greater evils. And those things which are more lasting are better than those which are more fleeting, and the more secure than the less; the enjoyment of the lasting has the advantage of being longer, and that of the secure has the advantage of suiting our wishes, being there for us whenever we like. Further, in accordance with the rule of co-ordinate terms and inflexions of the same stem, what is true of one such related word is true of all. Thus if the action qualified by the term 'brave' is more noble and desirable than the action qualified by the term 'temperate', then 'bravery' is more desirable than 'temperance' and 'being brave' than 'being temperate'. That, again, which is chosen by all is a greater good than that which is not, and that chosen by the majority than that chosen by the minority. For that which all desire is good, as we have said;' and so, the more a thing is desired, the better it is. Further, that is the better thing which is considered so by competitors or enemies, or, again, by authorized judges or those whom they select to represent them. In the first two cases the decision is virtually that of every one, in the last two that of authorities and experts. And sometimes it may be argued that what all share is the better thing, since it is a dishonour not to share in it; at other times, that what none or few share is better, since it is rarer. The more praiseworthy things are, the nobler and therefore the better they are. So with the things that earn greater honours than others –

honour is, as it were, a measure of value; and the things whose absence involves comparatively heavy penalties; and the things that are better than others admitted or believed to be good. Moreover, things look better merely by being divided into their parts, since they then seem to surpass a greater number of things than before. Hence Homer says that Meleager was roused to battle by the thought of

All horrors that light on a folk whose city is ta'en of their foes,

When they slaughter the men, when the burg is wasted with ravening flame,

When strangers are haling young children to thraldom, (fair women to shame.)

The same effect is produced by piling up facts in a climax after the manner of Epicharmus. The reason is partly the same as in the case of division (for combination too makes the impression of great superiority), and partly that the original thing appears to be the cause and origin of important results. And since a thing is better when it is harder or rarer than other things, its superiority may be due to seasons, ages, places, times, or one's natural powers. When a man accomplishes something beyond his natural power, or beyond his years, or beyond the measure of people like him, or in a special way, or at a special place or time, his deed will have a high degree of nobleness, goodness, and justice, or of their opposites. Hence the epigram on the victor at the Olympic games:

In time past, hearing a Yoke on my shoulders, of wood unshaven,

I carried my loads of fish from, Argos to Tegea town.

So Iphicrates used to extol himself by describing the low estate from which he had risen. Again, what is natural is better than what is acquired, since it is harder to come by. Hence the words of Homer:

I have learnt from none but myself.

And the best part of a good thing is particularly good; as when Pericles in his funeral oration said that the country's loss of its young

men in battle was ‘as if the spring were taken out of the year’. So with those things which are of service when the need is pressing; for example, in old age and times of sickness. And of two things that which leads more directly to the end in view is the better. So too is that which is better for people generally as well as for a particular individual. Again, what can be got is better than what cannot, for it is good in a given case and the other thing is not. And what is at the end of life is better than what is not, since those things are ends in a greater degree which are nearer the end. What aims at reality is better than what aims at appearance. We may define what aims at appearance as what a man will not choose if nobody is to know of his having it. This would seem to show that to receive benefits is more desirable than to confer them, since a man will choose the former even if nobody is to know of it, but it is not the general view that he will choose the latter if nobody knows of it. What a man wants to be is better than what a man wants to seem, for in aiming at that he is aiming more at reality. Hence men say that justice is of small value, since it is more desirable to seem just than to be just, whereas with health it is not so. That is better than other things which is more useful than they are for a number of different purposes; for example, that which promotes life, good life, pleasure, and noble conduct. For this reason wealth and health are commonly thought to be of the highest value, as possessing all these advantages. Again, that is better than other things which is accompanied both with less pain and with actual pleasure; for here there is more than one advantage; and so here we have the good of feeling pleasure and also the good of not feeling pain. And of two good things that is the better whose addition to a third thing makes a better whole than the addition of the other to the same thing will make. Again, those things which we are seen to possess are better than those which we are not seen to possess, since the former have the air of reality. Hence wealth may be regarded as a greater good if its existence is known to others. That which is dearly prized is better than what is not – the sort of thing that some people have only one of, though others have more like it. Accordingly, blinding a one-eyed man inflicts worse injury than half-blinding a man with two eyes; for the one-eyed man has been robbed of what he dearly prized.

The grounds on which we must base our arguments, when we are speaking for or against a proposal, have now been set forth more or less completely.

8

The most important and effective qualification for success in persuading audiences and speaking well on public affairs is to understand all the forms of government and to discriminate their respective customs, institutions, and interests. For all men are persuaded by considerations of their interest, and their interest lies in the maintenance of the established order. Further, it rests with the supreme authority to give authoritative decisions, and this varies with each form of government; there are as many different supreme authorities as there are different forms of government. The forms of government are four-democracy, oligarchy, aristocracy, monarchy. The supreme right to judge and decide always rests, therefore, with either a part or the whole of one or other of these governing powers.

A Democracy is a form of government under which the citizens distribute the offices of state among themselves by lot, whereas under oligarchy there is a property qualification, under aristocracy one of education. By education I mean that education which is laid down by the law; for it is those who have been loyal to the national institutions that hold office under an aristocracy. These are bound to be looked upon as 'the best men', and it is from this fact that this form of government has derived its name ('the rule of the best'). Monarchy, as the word implies, is the constitution a in which one man has authority over all. There are two forms of monarchy: kingship, which is limited by prescribed conditions, and 'tyranny', which is not limited by anything.

We must also notice the ends which the various forms of government pursue, since people choose in practice such actions as will lead to the realization of their ends. The end of democracy is freedom; of

oligarchy, wealth; of aristocracy, the maintenance of education and national institutions; of tyranny, the protection of the tyrant. It is clear, then, that we must distinguish those particular customs, institutions, and interests which tend to realize the ideal of each constitution, since men choose their means with reference to their ends. But rhetorical persuasion is effected not only by demonstrative but by ethical argument; it helps a speaker to convince us, if we believe that he has certain qualities himself, namely, goodness, or goodwill towards us, or both together. Similarly, we should know the moral qualities characteristic of each form of government, for the special moral character of each is bound to provide us with our most effective means of persuasion in dealing with it. We shall learn the qualities of governments in the same way as we learn the qualities of individuals, since they are revealed in their deliberate acts of choice; and these are determined by the end that inspires them.

We have now considered the objects, immediate or distant, at which we are to aim when urging any proposal, and the grounds on which we are to base our arguments in favour of its utility. We have also briefly considered the means and methods by which we shall gain a good knowledge of the moral qualities and institutions peculiar to the various forms of government – only, however, to the extent demanded by the present occasion; a detailed account of the subject has been given in the Politics.

9

We have now to consider Virtue and Vice, the Noble and the Base, since these are the objects of praise and blame. In doing so, we shall at the same time be finding out how to make our hearers take the required view of our own characters – our second method of persuasion. The ways in which to make them trust the goodness of other people are also the ways in which to make them trust our own. Praise, again, may be serious or frivolous; nor is it always of a human or divine being but often of inanimate things, or of the humblest of

the lower animals. Here too we must know on what grounds to argue, and must, therefore, now discuss the subject, though by way of illustration only.

The Noble is that which is both desirable for its own sake and also worthy of praise; or that which is both good and also pleasant because good. If this is a true definition of the Noble, it follows that virtue must be noble, since it is both a good thing and also praiseworthy. Virtue is, according to the usual view, a faculty of providing and preserving good things; or a faculty of conferring many great benefits, and benefits of all kinds on all occasions. The forms of Virtue are justice, courage, temperance, magnificence, magnanimity, liberality, gentleness, prudence, wisdom. If virtue is a faculty of beneficence, the highest kinds of it must be those which are most useful to others, and for this reason men honour most the just and the courageous, since courage is useful to others in war, justice both in war and in peace. Next comes liberality; liberal people let their money go instead of fighting for it, whereas other people care more for money than for anything else. Justice is the virtue through which everybody enjoys his own possessions in accordance with the law; its opposite is injustice, through which men enjoy the possessions of others in defiance of the law. Courage is the virtue that disposes men to do noble deeds in situations of danger, in accordance with the law and in obedience to its commands; cowardice is the opposite. Temperance is the virtue that disposes us to obey the law where physical pleasures are concerned; incontinence is the opposite. Liberality disposes us to spend money for others' good; illiberality is the opposite. Magnanimity is the virtue that disposes us to do good to others on a large scale; [its opposite is meanness of spirit]. Magnificence is a virtue productive of greatness in matters involving the spending of money. The opposites of these two are smallness of spirit and meanness respectively. Prudence is that virtue of the understanding which enables men to come to wise decisions about the relation to happiness of the goods and evils that have been previously mentioned.

The above is a sufficient account, for our present purpose, of virtue and vice in general, and of their various forms. As to further aspects

of the subject, it is not difficult to discern the facts; it is evident that things productive of virtue are noble, as tending towards virtue; and also the effects of virtue, that is, the signs of its presence and the acts to which it leads. And since the signs of virtue, and such acts as it is the mark of a virtuous man to do or have done to him, are noble, it follows that all deeds or signs of courage, and everything done courageously, must be noble things; and so with what is just and actions done justly. (Not, however, actions justly done to us; here justice is unlike the other virtues; 'justly' does not always mean 'nobly'; when a man is punished, it is more shameful that this should be justly than unjustly done to him). The same is true of the other virtues. Again, those actions are noble for which the reward is simply honour, or honour more than money. So are those in which a man aims at something desirable for some one else's sake; actions good absolutely, such as those a man does for his country without thinking of himself; actions good in their own nature; actions that are not good simply for the individual, since individual interests are selfish. Noble also are those actions whose advantage may be enjoyed after death, as opposed to those whose advantage is enjoyed during one's lifetime: for the latter are more likely to be for one's own sake only. Also, all actions done for the sake of others, since less than other actions are done for one's own sake; and all successes which benefit others and not oneself; and services done to one's benefactors, for this is just; and good deeds generally, since they are not directed to one's own profit. And the opposites of those things of which men feel ashamed, for men are ashamed of saying, doing, or intending to do shameful things. So when Alcacus said

Something I fain would say to thee,

Only shame restraineth me,

Sappho wrote

If for things good and noble thou wert yearning,

If to speak baseness were thy tongue not burning,

No load of shame would on thine eyelids weigh;

What thou with honour wishest thou wouldst say.

Those things, also, are noble for which men strive anxiously, without feeling fear; for they feel thus about the good things which lead to fair fame. Again, one quality or action is nobler than another if it is that of a naturally finer being: thus a man's will be nobler than a woman's. And those qualities are noble which give more pleasure to other people than to their possessors; hence the nobleness of justice and just actions. It is noble to avenge oneself on one's enemies and not to come to terms with them; for requital is just, and the just is noble; and not to surrender is a sign of courage. Victory, too, and honour belong to the class of noble things, since they are desirable even when they yield no fruits, and they prove our superiority in good qualities. Things that deserve to be remembered are noble, and the more they deserve this, the nobler they are. So are the things that continue even after death; those which are always attended by honour; those which are exceptional; and those which are possessed by one person alone – these last are more readily remembered than others. So again are possessions that bring no profit, since they are more fitting than others for a gentleman. So are the distinctive qualities of a particular people, and the symbols of what it specially admires, like long hair in Sparta, where this is a mark of a free man, as it is not easy to perform any menial task when one's hair is long. Again, it is noble not to practise any sordid craft, since it is the mark of a free man not to live at another's beck and call. We are also to assume when we wish either to praise a man or blame him that qualities closely allied to those which he actually has are identical with them; for instance, that the cautious man is cold-blooded and treacherous, and that the stupid man is an honest fellow or the thick-skinned man a good-tempered one. We can always idealize any given man by drawing on the virtues akin to his actual qualities; thus we may say that the passionate and excitable man is 'outspoken'; or that the arrogant man is 'superb' or 'impressive'. Those who run to extremes will be said to possess the corresponding good qualities; rashness will be called courage, and extravagance generosity. That will be what most people think; and at the same time this method enables an advocate to draw a misleading inference from the motive, arguing that if a man runs into danger needlessly, much more will he

do so in a noble cause; and if a man is open-handed to any one and every one, he will be so to his friends also, since it is the extreme form of goodness to be good to everybody.

We must also take into account the nature of our particular audience when making a speech of praise; for, as Socrates used to say, 'it is not difficult to praise the Athenians to an Athenian audience.' If the audience esteems a given quality, we must say that our hero has that quality, no matter whether we are addressing Scythians or Spartans or philosophers. Everything, in fact, that is esteemed we are to represent as noble. After all, people regard the two things as much the same.

All actions are noble that are appropriate to the man who does them: if, for instance, they are worthy of his ancestors or of his own past career. For it makes for happiness, and is a noble thing, that he should add to the honour he already has. Even inappropriate actions are noble if they are better and nobler than the appropriate ones would be; for instance, if one who was just an average person when all went well becomes a hero in adversity, or if he becomes better and easier to get on with the higher he rises. Compare the saying of lphicrates, 'Think what I was and what I am'; and the epigram on the victor at the Olympic games,

In time past, bearing a yoke on my shoulders,

of wood unshaven, and the encomium of Simonides,

A woman whose father, whose husband, whose

brethren were princes all.

Since we praise a man for what he has actually done, and fine actions are distinguished from others by being intentionally good, we must try to prove that our hero's noble acts are intentional. This is all the easier if we can make out that he has often acted so before, and therefore we must assert coincidences and accidents to have been intended. Produce a number of good actions, all of the same kind,

and people will think that they must have been intended, and that they prove the good qualities of the man who did them.

Praise is the expression in words of the eminence of a man's good qualities, and therefore we must display his actions as the product of such qualities. Encomium refers to what he has actually done; the mention of accessories, such as good birth and education, merely helps to make our story credible – good fathers are likely to have good sons, and good training is likely to produce good character. Hence it is only when a man has already done something that we bestow encomiums upon him. Yet the actual deeds are evidence of the doer's character: even if a man has not actually done a given good thing, we shall bestow praise on him, if we are sure that he is the sort of man who would do it. To call any one blest is, it may be added, the same thing as to call him happy; but these are not the same thing as to bestow praise and encomium upon him; the two latter are a part of 'calling happy', just as goodness is a part of happiness.

To praise a man is in one respect akin to urging a course of action. The suggestions which would be made in the latter case become encomiums when differently expressed. When we know what action or character is required, then, in order to express these facts as suggestions for action, we have to change and reverse our form of words. Thus the statement 'A man should be proud not of what he owes to fortune but of what he owes to himself', if put like this, amounts to a suggestion; to make it into praise we must put it thus, 'Since he is proud not of what he owes to fortune but of what he owes to himself.' Consequently, whenever you want to praise any one, think what you would urge people to do; and when you want to urge the doing of anything, think what you would praise a man for having done. Since suggestion may or may not forbid an action, the praise into which we convert it must have one or other of two opposite forms of expression accordingly.

There are, also, many useful ways of heightening the effect of praise. We must, for instance, point out that a man is the only one, or the first, or almost the only one who has done something, or that he has done it better than any one else; all these distinctions are

honourable. And we must, further, make much of the particular season and occasion of an action, arguing that we could hardly have looked for it just then. If a man has often achieved the same success, we must mention this; that is a strong point; he himself, and not luck, will then be given the credit. So, too, if it is on his account that observances have been devised and instituted to encourage or honour such achievements as his own: thus we may praise Hippolochus because the first encomium ever made was for him, or Harmodius and Aristogeiton because their statues were the first to be put up in the market-place. And we may censure bad men for the opposite reason.

Again, if you cannot find enough to say of a man himself, you may pit him against others, which is what Isocrates used to do owing to his want of familiarity with forensic pleading. The comparison should be with famous men; that will strengthen your case; it is a noble thing to surpass men who are themselves great. It is only natural that methods of 'heightening the effect' should be attached particularly to speeches of praise; they aim at proving superiority over others, and any such superiority is a form of nobleness. Hence if you cannot compare your hero with famous men, you should at least compare him with other people generally, since any superiority is held to reveal excellence. And, in general, of the lines of argument which are common to all speeches, this 'heightening of effect' is most suitable for declamations, where we take our hero's actions as admitted facts, and our business is simply to invest these with dignity and nobility. 'Examples' are most suitable to deliberative speeches; for we judge of future events by divination from past events. Enthymemes are most suitable to forensic speeches; it is our doubts about past events that most admit of arguments showing why a thing must have happened or proving that it did happen.

The above are the general lines on which all, or nearly all, speeches of praise or blame are constructed. We have seen the sort of thing we must bear in mind in making such speeches, and the materials out of which encomiums and censures are made. No special treatment of censure and vituperation is needed. Knowing the above facts, we

know their contraries; and it is out of these that speeches of censure are made.

10

We have next to treat of Accusation and Defence, and to enumerate and describe the ingredients of the syllogisms used therein. There are three things we must ascertain first, the nature and number of the incentives to wrong-doing; second, the state of mind of wrongdoers; third, the kind of persons who are wronged, and their condition. We will deal with these questions in order. But before that let us define the act of 'wrong-doing'.

We may describe 'wrong-doing' as injury voluntarily inflicted contrary to law. 'Law' is either special or general. By special law I mean that written law which regulates the life of a particular community; by general law, all those unwritten principles which are supposed to be acknowledged everywhere. We do things 'voluntarily' when we do them consciously and without constraint. (Not all voluntary acts are deliberate, but all deliberate acts are conscious – no one is ignorant of what he deliberately intends.) The causes of our deliberately intending harmful and wicked acts contrary to law are (1) vice, (2) lack of self-control. For the wrongs a man does to others will correspond to the bad quality or qualities that he himself possesses. Thus it is the mean man who will wrong others about money, the profligate in matters of physical pleasure, the effeminate in matters of comfort, and the coward where danger is concerned – his terror makes him abandon those who are involved in the same danger. The ambitious man does wrong for sake of honour, the quick-tempered from anger, the lover of victory for the sake of victory, the embittered man for the sake of revenge, the stupid man because he has misguided notions of right and wrong, the shameless man because he does not mind what people think of him; and so with the rest – any wrong that any one does to others corresponds to his particular faults of character.

However, this subject has already been cleared up in part in our discussion of the virtues and will be further explained later when we treat of the emotions. We have now to consider the motives and states of mind of wrongdoers, and to whom they do wrong.

Let us first decide what sort of things people are trying to get or avoid when they set about doing wrong to others. For it is plain that the prosecutor must consider, out of all the aims that can ever induce us to do wrong to our neighbours, how many, and which, affect his adversary; while the defendant must consider how many, and which, do not affect him. Now every action of every person either is or is not due to that person himself. Of those not due to himself some are due to chance, the others to necessity; of these latter, again, some are due to compulsion, the others to nature. Consequently all actions that are not due to a man himself are due either to chance or to nature or to compulsion. All actions that are due to a man himself and caused by himself are due either to habit or to rational or irrational craving. Rational craving is a craving for good, i.e. a wish – nobody wishes for anything unless he thinks it good. Irrational craving is twofold, viz. anger and appetite.

Thus every action must be due to one or other of seven causes: chance, nature, compulsion, habit, reasoning, anger, or appetite. It is superfluous further to distinguish actions according to the doers' ages, moral states, or the like; it is of course true that, for instance, young men do have hot tempers and strong appetites; still, it is not through youth that they act accordingly, but through anger or appetite. Nor, again, is action due to wealth or poverty; it is of course true that poor men, being short of money, do have an appetite for it, and that rich men, being able to command needless pleasures, do have an appetite for such pleasures: but here, again, their actions will be due not to wealth or poverty but to appetite. Similarly, with just men, and unjust men, and all others who are said to act in accordance with their moral qualities, their actions will really be due to one of the causes mentioned – either reasoning or emotion: due, indeed, sometimes to good dispositions and good emotions, and sometimes to bad; but that good qualities should be followed by good emotions, and bad by bad, is merely an accessory fact – it is no doubt

true that the temperate man, for instance, because he is temperate, is always and at once attended by healthy opinions and appetites in regard to pleasant things, and the intemperate man by unhealthy ones. So we must ignore such distinctions. Still we must consider what kinds of actions and of people usually go together; for while there are no definite kinds of action associated with the fact that a man is fair or dark, tall or short, it does make a difference if he is young or old, just or unjust. And, generally speaking, all those accessory qualities that cause distinctions of human character are important: e.g. the sense of wealth or poverty, of being lucky or unlucky. This shall be dealt with later – let us now deal first with the rest of the subject before us.

The things that happen by chance are all those whose cause cannot be determined, that have no purpose, and that happen neither always nor usually nor in any fixed way. The definition of chance shows just what they are. Those things happen by nature which have a fixed and internal cause; they take place uniformly, either always or usually. There is no need to discuss in exact detail the things that happen contrary to nature, nor to ask whether they happen in some sense naturally or from some other cause; it would seem that chance is at least partly the cause of such events. Those things happen through compulsion which take place contrary to the desire or reason of the doer, yet through his own agency. Acts are done from habit which men do because they have often done them before. Actions are due to reasoning when, in view of any of the goods already mentioned, they appear useful either as ends or as means to an end, and are performed for that reason: 'for that reason,' since even licentious persons perform a certain number of useful actions, but because they are pleasant and not because they are useful. To passion and anger are due all acts of revenge. Revenge and punishment are different things. Punishment is inflicted for the sake of the person punished; revenge for that of the punisher, to satisfy his feelings. (What anger is will be made clear when we come to discuss the emotions.) Appetite is the cause of all actions that appear pleasant. Habit, whether acquired by mere familiarity or by effort, belongs to the class of pleasant things, for there are many actions not naturally pleasant which men perform with pleasure, once they have

become used to them. To sum up then, all actions due to ourselves either are or seem to be either good or pleasant. Moreover, as all actions due to ourselves are done voluntarily and actions not due to ourselves are done involuntarily, it follows that all voluntary actions must either be or seem to be either good or pleasant; for I reckon among goods escape from evils or apparent evils and the exchange of a greater evil for a less (since these things are in a sense positively desirable), and likewise I count among pleasures escape from painful or apparently painful things and the exchange of a greater pain for a less. We must ascertain, then, the number and nature of the things that are useful and pleasant. The useful has been previously examined in connexion with political oratory; let us now proceed to examine the pleasant. Our various definitions must be regarded as adequate, even if they are not exact, provided they are clear.

11

We may lay it down that Pleasure is a movement, a movement by which the soul as a whole is consciously brought into its normal state of being; and that Pain is the opposite. If this is what pleasure is, it is clear that the pleasant is what tends to produce this condition, while that which tends to destroy it, or to cause the soul to be brought into the opposite state, is painful. It must therefore be pleasant as a rule to move towards a natural state of being, particularly when a natural process has achieved the complete recovery of that natural state. Habits also are pleasant; for as soon as a thing has become habitual, it is virtually natural; habit is a thing not unlike nature; what happens often is akin to what happens always, natural events happening always, habitual events often. Again, that is pleasant which is not forced on us; for force is unnatural, and that is why what is compulsory, painful, and it has been rightly said

All that is done on compulsion is bitterness unto the soul. So all acts of concentration, strong effort, and strain are necessarily painful;

they all involve compulsion and force, unless we are accustomed to them, in which case it is custom that makes them pleasant. The opposites to these are pleasant; and hence ease, freedom from toil, relaxation, amusement, rest, and sleep belong to the class of pleasant things; for these are all free from any element of compulsion. Everything, too, is pleasant for which we have the desire within us, since desire is the craving for pleasure. Of the desires some are irrational, some associated with reason. By irrational I mean those which do not arise from any opinion held by the mind. Of this kind are those known as 'natural'; for instance, those originating in the body, such as the desire for nourishment, namely hunger and thirst, and a separate kind of desire answering to each kind of nourishment; and the desires connected with taste and sex and sensations of touch in general; and those of smell, hearing, and vision. Rational desires are those which we are induced to have; there are many things we desire to see or get because we have been told of them and induced to believe them good. Further, pleasure is the consciousness through the senses of a certain kind of emotion; but imagination is a feeble sort of sensation, and there will always be in the mind of a man who remembers or expects something an image or picture of what he remembers or expects. If this is so, it is clear that memory and expectation also, being accompanied by sensation, may be accompanied by pleasure. It follows that anything pleasant is either present and perceived, past and remembered, or future and expected, since we perceive present pleasures, remember past ones, and expect future ones. Now the things that are pleasant to remember are not only those that, when actually perceived as present, were pleasant, but also some things that were not, provided that their results have subsequently proved noble and good. Hence the words

Sweet 'tis when rescued to remember pain, and

Even his griefs are a joy long after to one that remembers

All that he wrought and endured.

The reason of this is that it is pleasant even to be merely free from evil. The things it is pleasant to expect are those that when present are felt to afford us either great delight or great but not painful

benefit. And in general, all the things that delight us when they are present also do so, as a rule, when we merely remember or expect them. Hence even being angry is pleasant – Homer said of wrath that

Sweeter it is by far than the honeycomb dripping with sweetness – for no one grows angry with a person on whom there is no prospect of taking vengeance, and we feel comparatively little anger, or none at all, with those who are much our superiors in power. Some pleasant feeling is associated with most of our appetites we are enjoying either the memory of a past pleasure or the expectation of a future one, just as persons down with fever, during their attacks of thirst, enjoy remembering the drinks they have had and looking forward to having more. So also a lover enjoys talking or writing about his loved one, or doing any little thing connected with him; all these things recall him to memory and make him actually present to the eye of imagination. Indeed, it is always the first sign of love, that besides enjoying some one's presence, we remember him when he is gone, and feel pain as well as pleasure, because he is there no longer. Similarly there is an element of pleasure even in mourning and lamentation for the departed. There is grief, indeed, at his loss, but pleasure in remembering him and as it were seeing him before us in his deeds and in his life. We can well believe the poet when he says

He spake, and in each man's heart he awakened the love of lament.

Revenge, too, is pleasant; it is pleasant to get anything that it is painful to fail to get, and angry people suffer extreme pain when they fail to get their revenge; but they enjoy the prospect of getting it. Victory also is pleasant, and not merely to 'bad losers', but to every one; the winner sees himself in the light of a champion, and everybody has a more or less keen appetite for being that. The pleasantness of victory implies of course that combative sports and intellectual contests are pleasant (since in these it often happens that some one wins) and also games like knuckle-bones, ball, dice, and draughts. And similarly with the serious sports; some of these become pleasant when one is accustomed to them; while others are pleasant from the first, like hunting with hounds, or indeed any kind of hunting. For where there is competition, there is victory. That is

why forensic pleading and debating contests are pleasant to those who are accustomed to them and have the capacity for them. Honour and good repute are among the most pleasant things of all; they make a man see himself in the character of a fine fellow, especially when he is credited with it by people whom he thinks good judges. His neighbours are better judges than people at a distance; his associates and fellow-countrymen better than strangers; his contemporaries better than posterity; sensible persons better than foolish ones; a large number of people better than a small number: those of the former class, in each case, are the more likely to be good judges of him. Honour and credit bestowed by those whom you think much inferior to yourself – e.g. children or animals – you do not value: not for its own sake, anyhow: if you do value it, it is for some other reason. Friends belong to the class of pleasant things; it is pleasant to love – if you love wine, you certainly find it delightful: and it is pleasant to be loved, for this too makes a man see himself as the possessor of goodness, a thing that every being that has a feeling for it desires to possess: to be loved means to be valued for one's own personal qualities. To be admired is also pleasant, simply because of the honour implied. Flattery and flatterers are pleasant: the flatterer is a man who, you believe, admires and likes To do the same thing often is pleasant, since, as we saw, anything habitual is pleasant. And to change is also pleasant: change means an approach to nature, whereas invariable repetition of anything causes the excessive prolongation of a settled condition: therefore, says the poet,

Change is in all things sweet.

That is why what comes to us only at long intervals is pleasant, whether it be a person or a thing; for it is a change from what we had before, and, besides, what comes only at long intervals has the value of rarity. Learning things and wondering at things are also pleasant as a rule; wondering implies the desire of learning, so that the object of wonder is an object of desire; while in learning one is brought into one's natural condition. Conferring and receiving benefits belong to the class of pleasant things; to receive a benefit is to get what one desires; to confer a benefit implies both posses sion and superiority, both of which are things we try to attain. It is because beneficent acts

are pleasant that people find it pleasant to put their neighbours straight again and to supply what they lack. Again, since learning and wondering are pleasant, it follows that such things as acts of imitation must be pleasant – for instance, painting, sculpture, poetry and every product of skilful imitation; this latter, even if the object imitated is not itself pleasant; for it is not the object itself which here gives delight; the spectator draws inferences ('That is a so-and-so') and thus learns something fresh. Dramatic turns of fortune and hairbreadth escapes from perils are pleasant, because we feel all such things are wonderful.

And since what is natural is pleasant, and things akin to each other seem natural to each other, therefore all kindred and similar things are usually pleasant to each other; for instance, one man, horse, or young person is pleasant to another man, horse, or young person. Hence the proverbs 'mate delights mate', 'like to like', 'beast knows beast', 'jackdaw to jackdaw', and the rest of them. But since everything like and akin to oneself is pleasant, and since every man is himself more like and akin to himself than any one else is, it follows that all of us must be more or less fond of ourselves. For all this resemblance and kinship is present particularly in the relation of an individual to himself. And because we are all fond of ourselves, it follows that what is our own is pleasant to all of us, as for instance our own deeds and words. That is why we are usually fond of our flatterers, [our lovers,] and honour; also of our children, for our children are our own work. It is also pleasant to complete what is defective, for the whole thing thereupon becomes our own work. And since power over others is very pleasant, it is pleasant to be thought wise, for practical wisdom secures us power over others. (Scientific wisdom is also pleasant, because it is the knowledge of many wonderful things.) Again, since most of us are ambitious, it must be pleasant to disparage our neighbours as well as to have power over them. It is pleasant for a man to spend his time over what he feels he can do best; just as the poet says,

To that he bends himself,

To that each day allots most time, wherein

He is indeed the best part of himself.

Similarly, since amusement and every kind of relaxation and laughter too belong to the class of pleasant things, it follows that ludicrous things are pleasant, whether men, words, or deeds. We have discussed the ludicrous separately in the treatise on the Art of Poetry.

So much for the subject of pleasant things: by considering their opposites we can easily see what things are unpleasant.

12

The above are the motives that make men do wrong to others; we are next to consider the states of mind in which they do it, and the persons to whom they do it.

They must themselves suppose that the thing can be done, and done by them: either that they can do it without being found out, or that if they are found out they can escape being punished, or that if they are punished the disadvantage will be less than the gain for themselves or those they care for. The general subject of apparent possibility and impossibility will be handled later on, since it is relevant not only to forensic but to all kinds of speaking. But it may here be said that people think that they can themselves most easily do wrong to others without being punished for it if they possess eloquence, or practical ability, or much legal experience, or a large body of friends, or a great deal of money. Their confidence is greatest if they personally possess the advantages mentioned: but even without them they are satisfied if they have friends or supporters or partners who do possess them: they can thus both commit their crimes and escape being found out and punished for committing them. They are also safe, they think, if they are on good terms with their victims or with the judges who try them. Their victims will in that case not be on their guard against being wronged, and will make some arrangement with them instead of prosecuting; while their judges

will favour them because they like them, either letting them off altogether or imposing light sentences. They are not likely to be found out if their appearance contradicts the charges that might be brought against them: for instance, a weakling is unlikely to be charged with violent assault, or a poor and ugly man with adultery. Public and open injuries are the easiest to do, because nobody could at all suppose them possible, and therefore no precautions are taken. The same is true of crimes so great and terrible that no man living could be suspected of them: here too no precautions are taken. For all men guard against ordinary offences, just as they guard against ordinary diseases; but no one takes precautions against a disease that nobody has ever had. You feel safe, too, if you have either no enemies or a great many; if you have none, you expect not to be watched and therefore not to be detected; if you have a great many, you will be watched, and therefore people will think you can never risk an attempt on them, and you can defend your innocence by pointing out that you could never have taken such a risk. You may also trust to hide your crime by the way you do it or the place you do it in, or by some convenient means of disposal.

You may feel that even if you are found out you can stave off a trial, or have it postponed, or corrupt your judges: or that even if you are sentenced you can avoid paying damages, or can at least postpone doing so for a long time: or that you are so badly off that you will have nothing to lose. You may feel that the gain to be got by wrong-doing is great or certain or immediate, and that the penalty is small or uncertain or distant. It may be that the advantage to be gained is greater than any possible retribution: as in the case of despotic power, according to the popular view. You may consider your crimes as bringing you solid profit, while their punishment is nothing more than being called bad names. Or the opposite argument may appeal to you: your crimes may bring you some credit (thus you may, incidentally, be avenging your father or mother, like Zeno), whereas the punishment may amount to a fine, or banishment, or something of that sort. People may be led on to wrong others by either of these motives or feelings; but no man by both – they will affect people of quite opposite characters. You may be encouraged by having often escaped detection or punishment already; or by having often tried

and failed; for in crime, as in war, there are men who will always refuse to give up the struggle. You may get your pleasure on the spot and the pain later, or the gain on the spot and the loss later. That is what appeals to weak-willed persons – and weakness of will may be shown with regard to all the objects of desire. It may on the contrary appeal to you as it does appeal to self-controlled and sensible people – that the pain and loss are immediate, while the pleasure and profit come later and last longer. You may feel able to make it appear that your crime was due to chance, or to necessity, or to natural causes, or to habit: in fact, to put it generally, as if you had failed to do right rather than actually done wrong. You may be able to trust other people to judge you equitably. You may be stimulated by being in want: which may mean that you want necessaries, as poor people do, or that you want luxuries, as rich people do. You may be encouraged by having a particularly good reputation, because that will save you from being suspected: or by having a particularly bad one, because nothing you are likely to do will make it worse.

The above, then, are the various states of mind in which a man sets about doing wrong to others. The kind of people to whom he does wrong, and the ways in which he does it, must be considered next. The people to whom he does it are those who have what he wants himself, whether this means necessities or luxuries and materials for enjoyment. His victims may be far off or near at hand. If they are near, he gets his profit quickly; if they are far off, vengeance is slow, as those think who plunder the Carthaginians. They may be those who are trustful instead of being cautious and watchful, since all such people are easy to elude. Or those who are too easy-going to have enough energy to prosecute an offender. Or sensitive people, who are not apt to show fight over questions of money. Or those who have been wronged already by many people, and yet have not prosecuted; such men must surely be the proverbial 'Mysian prey'. Or those who have either never or often been wronged before; in neither case will they take precautions; if they have never been wronged they think they never will, and if they have often been wronged they feel that surely it cannot happen again. Or those whose character has been attacked in the past, or is exposed to attack in the future: they will be too much frightened of the judges to make up their minds to

prosecute, nor can they win their case if they do: this is true of those who are hated or unpopular. Another likely class of victim is those who their injurer can pretend have, themselves or through their ancestors or friends, treated badly, or intended to treat badly, the man himself, or his ancestors, or those he cares for; as the proverb says, 'wickedness needs but a pretext'. A man may wrong his enemies, because that is pleasant: he may equally wrong his friends, because that is easy. Then there are those who have no friends, and those who lack eloquence and practical capacity; these will either not attempt to prosecute, or they will come to terms, or failing that they will lose their case. There are those whom it does not pay to waste time in waiting for trial or damages, such as foreigners and small farmers; they will settle for a trifle, and always be ready to leave off. Also those who have themselves wronged others, either often, or in the same way as they are now being wronged themselves – for it is felt that next to no wrong is done to people when it is the same wrong as they have often themselves done to others: if, for instance, you assault a man who has been accustomed to behave with violence to others. So too with those who have done wrong to others, or have meant to, or mean to, or are likely to do so; there is something fine and pleasant in wronging such persons, it seems as though almost no wrong were done. Also those by doing wrong to whom we shall be gratifying our friends, or those we admire or love, or our masters, or in general the people by reference to whom we mould our lives. Also those whom we may wrong and yet be sure of equitable treatment. Also those against whom we have had any grievance, or any previous differences with them, as Callippus had when he behaved as he did to Dion: here too it seems as if almost no wrong were being done. Also those who are on the point of being wronged by others if we fail to wrong them ourselves, since here we feel we have no time left for thinking the matter over. So Aenesidemus is said to have sent the 'cottabus' prize to Gelon, who had just reduced a town to slavery, because Gelon had got there first and forestalled his own attempt. Also those by wronging whom we shall be able to do many righteous acts; for we feel that we can then easily cure the harm done. Thus Jason the Thessalian said that it is a duty to do some unjust acts in order to be able to do many just ones.

Among the kinds of wrong done to others are those that are done universally, or at least commonly: one expects to be forgiven for doing these. Also those that can easily be kept dark, as where things that can rapidly be consumed like eatables are concerned, or things that can easily be changed in shape, colour, or combination, or things that can easily be stowed away almost anywhere – portable objects that you can stow away in small corners, or things so like others of which you have plenty already that nobody can tell the difference. There are also wrongs of a kind that shame prevents the victim speaking about, such as outrages done to the women in his household or to himself or to his sons. Also those for which you would be thought very litigious to prosecute any one – trifling wrongs, or wrongs for which people are usually excused.

The above is a fairly complete account of the circumstances under which men do wrong to others, of the sort of wrongs they do, of the sort of persons to whom they do them, and of their reasons for doing them.

13

It will now be well to make a complete classification of just and unjust actions. We may begin by observing that they have been defined relatively to two kinds of law, and also relatively to two classes of persons. By the two kinds of law I mean particular law and universal law. Particular law is that which each community lays down and applies to its own members: this is partly written and partly unwritten. Universal law is the law of Nature. For there really is, as every one to some extent divines, a natural justice and injustice that is binding on all men, even on those who have no association or covenant with each other. It is this that Sophocles' Antigone clearly means when she says that the burial of Polyneices was a just act in spite of the prohibition: she means that it was just by nature.

Not of to-day or yesterday it is,

But lives eternal: none can date its birth. And so Empedocles, when he bids us kill no living creature, says that doing this is not just for some people while unjust for others,

Nay, but, an all-embracing law, through the realms of the sky

Unbroken it stretcheth, and over the earth's immensity.

And as Alcidamas says in his Messeniac Oration....

The actions that we ought to do or not to do have also been divided into two classes as affecting either the whole community or some one of its members. From this point of view we can perform just or unjust acts in either of two ways – towards one definite person, or towards the community. The man who is guilty of adultery or assault is doing wrong to some definite person; the man who avoids service in the army is doing wrong to the community.

Thus the whole class of unjust actions may be divided into two classes, those affecting the community, and those affecting one or more other persons. We will next, before going further, remind ourselves of what 'being wronged' means. Since it has already been settled that 'doing a wrong' must be intentional, 'being wronged' must consist in having an injury done to you by some one who intends to do it. In order to be wronged, a man must (1) suffer actual harm, (2) suffer it against his will. The various possible forms of harm are clearly explained by our previous, separate discussion of goods and evils. We have also seen that a voluntary action is one where the doer knows what he is doing. We now see that every accusation must be of an action affecting either the community or some individual. The doer of the action must either understand and intend the action, or not understand and intend it. In the former case, he must be acting either from deliberate choice or from passion. (Anger will be discussed when we speak of the passions the motives for crime and the state of mind of the criminal have already been discussed.) Now it often happens that a man will admit an act, but will not admit the prosecutor's label for the act nor the facts which that label implies. He will admit that he took a thing but not that he 'stole' it; that he struck some one first, but not that he committed 'outrage'; that he

had intercourse with a woman, but not that he committed ‘adultery’; that he is guilty of theft, but not that he is guilty of ‘sacrilege’, the object stolen not being consecrated; that he has encroached, but not that he has ‘encroached on State lands’; that he has been in communication with the enemy, but not that he has been guilty of ‘treason’. Here therefore we must be able to distinguish what is theft, outrage, or adultery, from what is not, if we are to be able to make the justice of our case clear, no matter whether our aim is to establish a man’s guilt or to establish his innocence. Wherever such charges are brought against a man, the question is whether he is or is not guilty of a criminal offence. It is deliberate purpose that constitutes wickedness and criminal guilt, and such names as ‘outrage’ or ‘theft’ imply deliberate purpose as well as the mere action. A blow does not always amount to ‘outrage’, but only if it is struck with some such purpose as to insult the man struck or gratify the striker himself. Nor does taking a thing without the owner’s knowledge always amount to ‘theft’, but only if it is taken with the intention of keeping it and injuring the owner. And as with these charges, so with all the others.

We saw that there are two kinds of right and wrong conduct towards others, one provided for by written ordinances, the other by unwritten. We have now discussed the kind about which the laws have something to say. The other kind has itself two varieties. First, there is the conduct that springs from exceptional goodness or badness, and is visited accordingly with censure and loss of honour, or with praise and increase of honour and decorations: for instance, gratitude to, or requital of, our benefactors, readiness to help our friends, and the like. The second kind makes up for the defects of a community’s written code of law. This is what we call equity; people regard it as just; it is, in fact, the sort of justice which goes beyond the written law. Its existence partly is and partly is not intended by legislators; not intended, where they have noticed no defect in the law; intended, where find themselves unable to define things exactly, and are obliged to legislate as if that held good always which in fact only holds good usually; or where it is not easy to be complete owing to the endless possible cases presented, such as the kinds and sizes of weapons that may be used to inflict wounds – a lifetime would be too short to make out a complete list of these. If, then, a precise

statement is impossible and yet legislation is necessary, the law must be expressed in wide terms; and so, if a man has no more than a finger-ring on his hand when he lifts it to strike or actually strikes another man, he is guilty of a criminal act according to the unwritten words of the law; but he is innocent really, and it is equity that declares him to be so. From this definition of equity it is plain what sort of actions, and what sort of persons, are equitable or the reverse. Equity must be applied to forgivable actions; and it must make us distinguish between criminal acts on the one hand, and errors of judgement, or misfortunes, on the other. (A 'misfortune' is an act, not due to moral badness, that has unexpected results: an 'error of judgement' is an act, also not due to moral badness, that has results that might have been expected: a 'criminal act' has results that might have been expected, but is due to moral badness, for that is the source of all actions inspired by our appetites.) Equity bids us be merciful to the weakness of human nature; to think less about the laws than about the man who framed them, and less about what he said than about what he meant; not to consider the actions of the accused so much as his intentions, nor this or that detail so much as the whole story; to ask not what a man is now but what he has always or usually been. It bids us remember benefits rather than injuries, and benefits received rather than benefits conferred; to be patient when we are wronged; to settle a dispute by negotiation and not by force; to prefer arbitration to motion – for an arbitrator goes by the equity of a case, a judge by the strict law, and arbitration was invented with the express purpose of securing full power for equity.

The above may be taken as a sufficient account of the nature of equity.

14

The worse of two acts of wrong done to others is that which is prompted by the worse disposition. Hence the most trifling acts may be the worst ones; as when Callistratus charged Melanopus with

having cheated the temple-builders of three consecrated half-obols. The converse is true of just acts. This is because the greater is here potentially contained in the less: there is no crime that a man who has stolen three consecrated half-obols would shrink from committing. Sometimes, however, the worse act is reckoned not in this way but by the greater harm that it does. Or it may be because no punishment for it is severe enough to be adequate; or the harm done may be incurable – a difficult and even hopeless crime to defend; or the sufferer may not be able to get his injurer legally punished, a fact that makes the harm incurable, since legal punishment and chastisement are the proper cure. Or again, the man who has suffered wrong may have inflicted some fearful punishment on himself; then the doer of the wrong ought in justice to receive a still more fearful punishment. Thus Sophocles, when pleading for retribution to Euctemon, who had cut his own throat because of the outrage done to him, said he would not fix a penalty less than the victim had fixed for himself. Again, a man's crime is worse if he has been the first man, or the only man, or almost the only man, to commit it: or if it is by no means the first time he has gone seriously wrong in the same way: or if his crime has led to the thinking-out and invention of measures to prevent and punish similar crimes – thus in Argos a penalty is inflicted on a man on whose account a law is passed, and also on those on whose account the prison was built: or if a crime is specially brutal, or specially deliberate: or if the report of it awakes more terror than pity. There are also such rhetorically effective ways of putting it as the following: That the accused has disregarded and broken not one but many solemn obligations like oaths, promises, pledges, or rights of intermarriage between states – here the crime is worse because it consists of many crimes; and that the crime was committed in the very place where criminals are punished, as for example perjurers do – it is argued that a man who will commit a crime in a law-court would commit it anywhere. Further, the worse deed is that which involves the doer in special shame; that whereby a man wrongs his benefactors – for he does more than one wrong, by not merely doing them harm but failing to do them good; that which breaks the unwritten laws of justice – the better sort of man will be just without being forced to be so, and the

written laws depend on force while the unwritten ones do not. It may however be argued otherwise, that the crime is worse which breaks the written laws: for the man who commits crimes for which terrible penalties are provided will not hesitate over crimes for which no penalty is provided at all. – So much, then, for the comparative badness of criminal actions.

15

There are also the so-called ‘non-technical’ means of persuasion; and we must now take a cursory view of these, since they are specially characteristic of forensic oratory. They are five in number: laws, witnesses, contracts, tortures, oaths.

First, then, let us take laws and see how they are to be used in persuasion and dissuasion, in accusation and defence. If the written law tells against our case, clearly we must appeal to the universal law, and insist on its greater equity and justice. We must argue that the juror’s oath ‘I will give my verdict according to honest opinion’ means that one will not simply follow the letter of the written law. We must urge that the principles of equity are permanent and changeless, and that the universal law does not change either, for it is the law of nature, whereas written laws often do change. This is the bearing the lines in Sophocles’ Antigone, where Antigone pleads that in burying her brother she had broken Creon’s law, but not the unwritten law:

Not of to-day or yesterday they are,

But live eternal: (none can date their birth.)

Not I would fear the wrath of any man

(And brave God’s vengeance) for defying these.

We shall argue that justice indeed is true and profitable, but that sham justice is not, and that consequently the written law is not, because it does not fulfil the true purpose of law. Or that justice is like silver, and must be assayed by the judges, if the genuine is to be distinguished from the counterfeit. Or that the better a man is, the more he will follow and abide by the unwritten law in preference to the written. Or perhaps that the law in question contradicts some other highly-esteemed law, or even contradicts itself. Thus it may be that one law will enact that all contracts must be held binding, while another forbids us ever to make illegal contracts. Or if a law is ambiguous, we shall turn it about and consider which construction best fits the interests of justice or utility, and then follow that way of looking at it. Or if, though the law still exists, the situation to meet which it was passed exists no longer, we must do our best to prove this and to combat the law thereby. If however the written law supports our case, we must urge that the oath 'to give my verdict according to my honest opinion' not meant to make the judges give a verdict that is contrary to the law, but to save them from the guilt of perjury if they misunderstand what the law really means. Or that no one chooses what is absolutely good, but every one what is good for himself. Or that not to use the laws is as ahas to have no laws at all. Or that, as in the other arts, it does not pay to try to be cleverer than the doctor: for less harm comes from the doctor's mistakes than from the growing habit of disobeying authority. Or that trying to be cleverer than the laws is just what is forbidden by those codes of law that are accounted best. – So far as the laws are concerned, the above discussion is probably sufficient.

As to witnesses, they are of two kinds, the ancient and the recent; and these latter, again, either do or do not share in the risks of the trial. By 'ancient' witnesses I mean the poets and all other notable persons whose judgements are known to all. Thus the Athenians appealed to Homer as a witness about Salamis; and the men of Tenedos not long ago appealed to Periander of Corinth in their dispute with the people of Sigeum; and Cleophon supported his accusation of Critias by quoting the elegiac verse of Solon, maintaining that discipline had long been slack in the family of Critias, or Solon would never have written,

Pray thee, bid the red-haired Critias do what his father commands him.

These witnesses are concerned with past events. As to future events we shall also appeal to soothsayers: thus Themistocles quoted the oracle about 'the wooden wall' as a reason for engaging the enemy's fleet. Further, proverbs are, as has been said, one form of evidence. Thus if you are urging somebody not to make a friend of an old man, you will appeal to the proverb,

Never show an old man kindness. Or if you are urging that he who has made away with fathers should also make away with their sons, quote,

Fool, who slayeth the father and leaveth his sons to avenge him. 'Recent' witnesses are well-known people who have expressed their opinions about some disputed matter: such opinions will be useful support for subsequent disputants on the same oints: thus Eubulus used in the law-courts against the reply Plato had made to Archibius, 'It has become the regular custom in this country to admit that one is a scoundrel'. There are also those witnesses who share the risk of punishment if their evidence is pronounced false. These are valid witnesses to the fact that an action was or was not done, that something is or is not the case; they are not valid witnesses to the quality of an action, to its being just or unjust, useful or harmful. On such questions of quality the opinion of detached persons is highly trustworthy. Most trustworthy of all are the 'ancient' witnesses, since they cannot be corrupted.

In dealing with the evidence of witnesses, the following are useful arguments. If you have no witnesses on your side, you will argue that the judges must decide from what is probable; that this is meant by 'giving a verdict in accordance with one's honest opinion'; that probabilities cannot be bribed to mislead the court; and that probabilities are never convicted of perjury. If you have witnesses, and the other man has not, you will argue that probabilities cannot be put on their trial, and that we could do without the evidence of witnesses altogether if we need do no more than balance the pleas advanced on either side.

The evidence of witnesses may refer either to ourselves or to our opponent; and either to questions of fact or to questions of personal character: so, clearly, we need never be at a loss for useful evidence. For if we have no evidence of fact supporting our own case or telling against that of our opponent, at least we can always find evidence to prove our own worth or our opponent's worthlessness. Other arguments about a witness – that he is a friend or an enemy or neutral, or has a good, bad, or indifferent reputation, and any other such distinctions – we must construct upon the same general lines as we use for the regular rhetorical proofs.

Concerning contracts argument can be so far employed as to increase or diminish their importance and their credibility; we shall try to increase both if they tell in our favour, and to diminish both if they tell in favour of our opponent. Now for confirming or upsetting the credibility of contracts the procedure is just the same as for dealing with witnesses, for the credit to be attached to contracts depends upon the character of those who have signed them or have the custody of them. The contract being once admitted genuine, we must insist on its importance, if it supports our case. We may argue that a contract is a law, though of a special and limited kind; and that, while contracts do not of course make the law binding, the law does make any lawful contract binding, and that the law itself as a whole is a of contract, so that any one who disregards or repudiates any contract is repudiating the law itself. Further, most business relations – those, namely, that are voluntary – are regulated by contracts, and if these lose their binding force, human intercourse ceases to exist. We need not go very deep to discover the other appropriate arguments of this kind. If, however, the contract tells against us and for our opponents, in the first place those arguments are suitable which we can use to fight a law that tells against us. We do not regard ourselves as bound to observe a bad law which it was a mistake ever to pass: and it is ridiculous to suppose that we are bound to observe a bad and mistaken contract. Again, we may argue that the duty of the judge as umpire is to decide what is just, and therefore he must ask where justice lies, and not what this or that document means. And that it is impossible to pervert justice by fraud or by force, since it is founded on nature, but a party to a contract may be the victim of either fraud

or force. Moreover, we must see if the contract contravenes either universal law or any written law of our own or another country; and also if it contradicts any other previous or subsequent contract; arguing that the subsequent is the binding contract, or else that the previous one was right and the subsequent one fraudulent – whichever way suits us. Further, we must consider the question of utility, noting whether the contract is against the interest of the judges or not; and so on – these arguments are as obvious as the others.

Examination by torture is one form of evidence, to which great weight is often attached because it is in a sense compulsory. Here again it is not hard to point out the available grounds for magnifying its value, if it happens to tell in our favour, and arguing that it is the only form of evidence that is infallible; or, on the other hand, for refuting it if it tells against us and for our opponent, when we may say what is true of torture of every kind alike, that people under its compulsion tell lies quite as often as they tell the truth, sometimes persistently refusing to tell the truth, sometimes recklessly making a false charge in order to be let off sooner. We ought to be able to quote cases, familiar to the judges, in which this sort of thing has actually happened. [We must say that evidence under torture is not trustworthy, the fact being that many men whether thick-witted, tough-skinned, or stout of heart endure their ordeal nobly, while cowards and timid men are full of boldness till they see the ordeal of these others: so that no trust can be placed in evidence under torture.]

In regard to oaths, a fourfold division can be made. A man may either both offer and accept an oath, or neither, or one without the other – that is, he may offer an oath but not accept one, or accept an oath but not offer one. There is also the situation that arises when an oath has already been sworn either by himself or by his opponent.

If you refuse to offer an oath, you may argue that men do not hesitate to perjure themselves; and that if your opponent does swear, you lose your money, whereas, if he does not, you think the judges will decide

against him; and that the risk of an unfavourable verdict is prefer, able, since you trust the judges and do not trust him.

If you refuse to accept an oath, you may argue that an oath is always paid for; that you would of course have taken it if you had been a rascal, since if you are a rascal you had better make something by it, and you would in that case have to swear in order to succeed. Thus your refusal, you argue, must be due to high principle, not to fear of perjury: and you may aptly quote the saying of Xenophanes,

'Tis not fair that he who fears not God should challenge him who doth. It is as if a strong man were to challenge a weakling to strike, or be struck by him.

If you agree to accept an oath, you may argue that you trust yourself but not your opponent; and that (to invert the remark of Xenophanes) the fair thing is for the impious man to offer the oath and for the pious man to accept it; and that it would be monstrous if you yourself were unwilling to accept an oath in a case where you demand that the judges should do so before giving their verdict. If you wish to offer an oath, you may argue that piety disposes you to commit the issue to the gods; and that your opponent ought not to want other judges than himself, since you leave the decision with him; and that it is outrageous for your opponents to refuse to swear about this question, when they insist that others should do so.

Now that we see how we are to argue in each case separately, we see also how we are to argue when they occur in pairs, namely, when you are willing to accept the oath but not to offer it; to offer it but not to accept it; both to accept and to offer it; or to do neither. These are of course combinations of the cases already mentioned, and so your arguments also must be combinations of the arguments already mentioned.

If you have already sworn an oath that contradicts your present one, you must argue that it is not perjury, since perjury is a crime, and a crime must be a voluntary action, whereas actions due to the force or fraud of others are involuntary. You must further reason from this that perjury depends on the intention and not on the spoken words.

But if it is your opponent who has already sworn an oath that contradicts his present one, you must say that if he does not abide by his oaths he is the enemy of society, and that this is the reason why men take an oath before administering the laws. 'My opponents insist that you, the judges, must abide by the oath you have sworn, and yet they are not abiding by their own oaths.' And there are other arguments which may be used to magnify the importance of the oath. [So much, then, for the 'non-technical' modes of persuasion.]

Book II

1

We have now considered the materials to be used in supporting or opposing a political measure, in pronouncing eulogies or censures, and for prosecution and defence in the law courts. We have considered the received opinions on which we may best base our arguments so as to convince our hearers – those opinions with which our enthymemes deal, and out of which they are built, in each of the three kinds of oratory, according to what may be called the special needs of each.

But since rhetoric exists to affect the giving of decisions – the hearers decide between one political speaker and another, and a legal verdict is a decision – the orator must not only try to make the argument of his speech demonstrative and worthy of belief; he must also make his own character look right and put his hearers, who are to decide, into the right frame of mind. Particularly in political oratory, but also in lawsuits, it adds much to an orator's influence that his own character should look right and that he should be thought to

entertain the right feelings towards his hearers; and also that his hearers themselves should be in just the right frame of mind. That the orator's own character should look right is particularly important in political speaking: that the audience should be in the right frame of mind, in lawsuits. When people are feeling friendly and placable, they think one sort of thing; when they are feeling angry or hostile, they think either something totally different or the same thing with a different intensity: when they feel friendly to the man who comes before them for judgement, they regard him as having done little wrong, if any; when they feel hostile, they take the opposite view. Again, if they are eager for, and have good hopes of, a thing that will be pleasant if it happens, they think that it certainly will happen and be good for them: whereas if they are indifferent or annoyed, they do not think so.

There are three things which inspire confidence in the orator's own character – the three, namely, that induce us to believe a thing apart from any proof of it: good sense, good moral character, and goodwill. False statements and bad advice are due to one or more of the following three causes. Men either form a false opinion through want of good sense; or they form a true opinion, but because of their moral badness do not say what they really think; or finally, they are both sensible and upright, but not well disposed to their hearers, and may fail in consequence to recommend what they know to be the best course. These are the only possible cases. It follows that any one who is thought to have all three of these good qualities will inspire trust in his audience. The way to make ourselves thought to be sensible and morally good must be gathered from the analysis of goodness already given: the way to establish your own goodness is the same as the way to establish that of others. Good will and friendliness of disposition will form part of our discussion of the emotions, to which we must now turn.

The Emotions are all those feelings that so change men as to affect their judgements, and that are also attended by pain or pleasure. Such are anger, pity, fear and the like, with their opposites. We must arrange what we have to say about each of them under three heads. Take, for instance, the emotion of anger: here we must discover (1)

what the state of mind of angry people is, (2) who the people are with whom they usually get angry, and (3) on what grounds they get angry with them. It is not enough to know one or even two of these points; unless we know all three, we shall be unable to arouse anger in any one. The same is true of the other emotions. So just as earlier in this work we drew up a list of useful propositions for the orator, let us now proceed in the same way to analyse the subject before us.

2

Anger may be defined as an impulse, accompanied by pain, to a conspicuous revenge for a conspicuous slight directed without justification towards what concerns oneself or towards what concerns one's friends. If this is a proper definition of anger, it must always be felt towards some particular individual, e.g. Cleon, and not 'man' in general. It must be felt because the other has done or intended to do something to him or one of his friends. It must always be attended by a certain pleasure – that which arises from the expectation of revenge. For since nobody aims at what he thinks he cannot attain, the angry man is aiming at what he can attain, and the belief that you will attain your aim is pleasant. Hence it has been well said about wrath,

Sweeter it is by far than the honeycomb dripping with sweetness,

And spreads through the hearts of men. It is also attended by a certain pleasure because the thoughts dwell upon the act of vengeance, and the images then called up cause pleasure, like the images called up in dreams.

Now slighting is the actively entertained opinion of something as obviously of no importance. We think bad things, as well as good ones, have serious importance; and we think the same of anything that tends to produce such things, while those which have little or no such tendency we consider unimportant. There are three kinds of

slighting-contempt, spite, and insolence. (1) Contempt is one kind of slighting: you feel contempt for what you consider unimportant, and it is just such things that you slight. (2) Spite is another kind; it is a thwarting another man's wishes, not to get something yourself but to prevent his getting it. The slight arises just from the fact that you do not aim at something for yourself: clearly you do not think that he can do you harm, for then you would be afraid of him instead of slighting him, nor yet that he can do you any good worth mentioning, for then you would be anxious to make friends with him. (3) Insolence is also a form of slighting, since it consists in doing and saying things that cause shame to the victim, not in order that anything may happen to yourself, or because anything has happened to yourself, but simply for the pleasure involved. (Retaliation is not 'insolence', but vengeance.) The cause of the pleasure thus enjoyed by the insolent man is that he thinks himself greatly superior to others when ill-treating them. That is why youths and rich men are insolent; they think themselves superior when they show insolence. One sort of insolence is to rob people of the honour due to them; you certainly slight them thus; for it is the unimportant, for good or evil, that has no honour paid to it. So Achilles says in anger:

He hath taken my prize for himself and hath done me dishonour, and

Like an alien honoured by none,

meaning that this is why he is angry. A man expects to be specially respected by his inferiors in birth, in capacity, in goodness, and generally in anything in which he is much their superior: as where money is concerned a wealthy man looks for respect from a poor man; where speaking is concerned, the man with a turn for oratory looks for respect from one who cannot speak; the ruler demands the respect of the ruled, and the man who thinks he ought to be a ruler demands the respect of the man whom he thinks he ought to be ruling. Hence it has been said

Great is the wrath of kings, whose father is Zeus almighty, and

Yea, but his rancour abideth long afterward also, their great resentment being due to their great superiority. Then again a man

looks for respect from those who he thinks owe him good treatment, and these are the people whom he has treated or is treating well, or means or has meant to treat well, either himself, or through his friends, or through others at his request.

It will be plain by now, from what has been said, (1) in what frame of mind, (2) with what persons, and (3) on what grounds people grow angry. (1) The frame of mind is that of one in which any pain is being felt. In that condition, a man is always aiming at something. Whether, then, another man opposes him either directly in any way, as by preventing him from drinking when he is thirsty, or indirectly, the act appears to him just the same; whether some one works against him, or fails to work with him, or otherwise vexes him while he is in this mood, he is equally angry in all these cases. Hence people who are afflicted by sickness or poverty or love or thirst or any other unsatisfied desires are prone to anger and easily roused: especially against those who slight their present distress. Thus a sick man is angered by disregard of his illness, a poor man by disregard of his poverty, a man aging war by disregard of the war he is waging, a lover by disregard of his love, and so throughout, any other sort of slight being enough if special slights are wanting. Each man is predisposed, by the emotion now controlling him, to his own particular anger. Further, we are angered if we happen to be expecting a contrary result: for a quite unexpected evil is specially painful, just as the quite unexpected fulfilment of our wishes is specially pleasant. Hence it is plain what seasons, times, conditions, and periods of life tend to stir men easily to anger, and where and when this will happen; and it is plain that the more we are under these conditions the more easily we are stirred.

These, then, are the frames of mind in which men are easily stirred to anger. The persons with whom we get angry are those who laugh, mock, or jeer at us, for such conduct is insolent. Also those who inflict injuries upon us that are marks of insolence. These injuries must be such as are neither retaliatory nor profitable to the doers: for only then will they be felt to be due to insolence. Also those who speak ill of us, and show contempt for us, in connexion with the things we ourselves most care about: thus those who are eager to win

fame as philosophers get angry with those who show contempt for their philosophy; those who pride themselves upon their appearance get angry with those who show contempt for their appearance and so on in other cases. We feel particularly angry on this account if we suspect that we are in fact, or that people think we are, lacking completely or to any effective extent in the qualities in question. For when we are convinced that we excel in the qualities for which we are jeered at, we can ignore the jeering. Again, we are angrier with our friends than with other people, since we feel that our friends ought to treat us well and not badly. We are angry with those who have usually treated us with honour or regard, if a change comes and they behave to us otherwise: for we think that they feel contempt for us, or they would still be behaving as they did before. And with those who do not return our kindnesses or fail to return them adequately, and with those who oppose us though they are our inferiors: for all such persons seem to feel contempt for us; those who oppose us seem to think us inferior to themselves, and those who do not return our kindnesses seem to think that those kindnesses were conferred by inferiors. And we feel particularly angry with men of no account at all, if they slight us. For, by our hypothesis, the anger caused by the slight is felt towards people who are not justified in slighting us, and our inferiors are not thus justified. Again, we feel angry with friends if they do not speak well of us or treat us well; and still more, if they do the contrary; or if they do not perceive our needs, which is why Plexippus is angry with Meleager in Antiphon's play; for this want of perception shows that they are slighting us – we do not fail to perceive the needs of those for whom we care. Again we are angry with those who rejoice at our misfortunes or simply keep cheerful in the midst of our misfortunes, since this shows that they either hate us or are slighting us. Also with those who are indifferent to the pain they give us: this is why we get angry with bringers of bad news. And with those who listen to stories about us or keep on looking at our weaknesses; this seems like either slighting us or hating us; for those who love us share in all our distresses and it must distress any one to keep on looking at his own weaknesses. Further, with those who slight us before five classes of people: namely, (1) our rivals, (2) those whom we admire, (3) those whom we wish to admire us, (4) those for

whom we feel reverence, (5) those who feel reverence for us: if any one slights us before such persons, we feel particularly angry. Again, we feel angry with those who slight us in connexion with what we are as honourable men bound to champion – our parents, children, wives, or subjects. And with those who do not return a favour, since such a slight is unjustifiable. Also with those who reply with humorous levity when we are speaking seriously, for such behaviour indicates contempt. And with those who treat us less well than they treat everybody else; it is another mark of contempt that they should think we do not deserve what every one else deserves. Forgetfulness, too, causes anger, as when our own names are forgotten, trifling as this may be; since forgetfulness is felt to be another sign that we are being slighted; it is due to negligence, and to neglect us is to slight us.

The persons with whom we feel anger, the frame of mind in which we feel it, and the reasons why we feel it, have now all been set forth. Clearly the orator will have to speak so as to bring his hearers into a frame of mind that will dispose them to anger, and to represent his adversaries as open to such charges and possessed of such qualities as do make people angry.

3

Since growing calm is the opposite of growing angry, and calmness the opposite of anger, we must ascertain in what frames of mind men are calm, towards whom they feel calm, and by what means they are made so. Growing calm may be defined as a settling down or quieting of anger. Now we get angry with those who slight us; and since slighting is a voluntary act, it is plain that we feel calm towards those who do nothing of the kind, or who do or seem to do it involuntarily. Also towards those who intended to do the opposite of what they did do. Also towards those who treat themselves as they have treated us: since no one can be supposed to slight himself. Also towards those who admit their fault and are sorry: since we accept their grief at what they have done as satisfaction, and cease to be

angry. The punishment of servants shows this: those who contradict us and deny their offence we punish all the more, but we cease to be incensed against those who agree that they deserved their punishment. The reason is that it is shameless to deny what is obvious, and those who are shameless towards us slight us and show contempt for us: anyhow, we do not feel shame before those of whom we are thoroughly contemptuous. Also we feel calm towards those who humble themselves before us and do not gainsay us; we feel that they thus admit themselves our inferiors, and inferiors feel fear, and nobody can slight any one so long as he feels afraid of him. That our anger ceases towards those who humble themselves before us is shown even by dogs, who do not bite people when they sit down. We also feel calm towards those who are serious when we are serious, because then we feel that we are treated seriously and not contemptuously. Also towards those who have done us more kindnesses than we have done them. Also towards those who pray to us and beg for mercy, since they humble themselves by doing so. Also towards those who do not insult or mock at or slight any one at all, or not any worthy person or any one like ourselves. In general, the things that make us calm may be inferred by seeing what the opposites are of those that make us angry. We are not angry with people we fear or respect, as long as we fear or respect them; you cannot be afraid of a person and also at the same time angry with him. Again, we feel no anger, or comparatively little, with those who have done what they did through anger: we do not feel that they have done it from a wish to slight us, for no one slights people when angry with them, since slighting is painless, and anger is painful. Nor do we grow angry with those who reverence us.

As to the frame of mind that makes people calm, it is plainly the opposite to that which makes them angry, as when they are amusing themselves or laughing or feasting; when they are feeling prosperous or successful or satisfied; when, in fine, they are enjoying freedom from pain, or inoffensive pleasure, or justifiable hope. Also when time has passed and their anger is no longer fresh, for time puts an end to anger. And vengeance previously taken on one person puts an end to even greater anger felt against another person. Hence Philocrates, being asked by some one, at a time when the public was angry with

him, 'Why don't you defend yourself?' did right to reply, 'The time is not yet.' 'Why, when is the time?' 'When I see someone else calumniated.' For men become calm when they have spent their anger on somebody else. This happened in the case of Ergophilus: though the people were more irritated against him than against Callisthenes, they acquitted him because they had condemned Callisthenes to death the day before. Again, men become calm if they have convicted the offender; or if he has already suffered worse things than they in their anger would have themselves inflicted upon him; for they feel as if they were already avenged. Or if they feel that they themselves are in the wrong and are suffering justly (for anger is not excited by what is just), since men no longer think then that they are suffering without justification; and anger, as we have seen, means this. Hence we ought always to inflict a preliminary punishment in words: if that is done, even slaves are less aggrieved by the actual punishment. We also feel calm if we think that the offender will not see that he is punished on our account and because of the way he has treated us. For anger has to do with individuals. This is plain from the definition. Hence the poet has well written:

Say that it was Odysseus, sacker of cities, implying that Odysseus would not have considered himself avenged unless the Cyclops perceived both by whom and for what he had been blinded. Consequently we do not get angry with any one who cannot be aware of our anger, and in particular we cease to be angry with people once they are dead, for we feel that the worst has been done to them, and that they will neither feel pain nor anything else that we in our anger aim at making them feel. And therefore the poet has well made Apollo say, in order to put a stop to the anger of Achilles against the dead Hector,

For behold in his fury he doeth despite to the senseless clay.

It is now plain that when you wish to calm others you must draw upon these lines of argument; you must put your hearers into the corresponding frame of mind, and represent those with whom they are angry as formidable, or as worthy of reverence, or as benefactors,

or as involuntary agents, or as much distressed at what they have done.

4

Let us now turn to Friendship and Enmity, and ask towards whom these feelings are entertained, and why. We will begin by defining and friendly feeling. We may describe friendly feeling towards any one as wishing for him what you believe to be good things, not for your own sake but for his, and being inclined, so far as you can, to bring these things about. A friend is one who feels thus and excites these feelings in return: those who think they feel thus towards each other think themselves friends. This being assumed, it follows that your friend is the sort of man who shares your pleasure in what is good and your pain in what is unpleasant, for your sake and for no other reason. This pleasure and pain of his will be the token of his good wishes for you, since we all feel glad at getting what we wish for, and pained at getting what we do not. Those, then, are friends to whom the same things are good and evil; and those who are, moreover, friendly or unfriendly to the same people; for in that case they must have the same wishes, and thus by wishing for each other what they wish for themselves, they show themselves each other's friends. Again, we feel friendly to those who have treated us well, either ourselves or those we care for, whether on a large scale, or readily, or at some particular crisis; provided it was for our own sake. And also to those who we think wish to treat us well. And also to our friends' friends, and to those who like, or are liked by, those whom we like ourselves. And also to those who are enemies to those whose enemies we are, and dislike, or are disliked by, those whom we dislike. For all such persons think the things good which we think good, so that they wish what is good for us; and this, as we saw, is what friends must do. And also to those who are willing to treat us well where money or our personal safety is concerned: and therefore we value those who are liberal, brave, or just. The just we consider to be those who do not live on others; which means those who work for

their living, especially farmers and others who work with their own hands. We also like temperate men, because they are not unjust to others; and, for the same reason, those who mind their own business. And also those whose friends we wish to be, if it is plain that they wish to be our friends: such are the morally good, and those well thought of by every one, by the best men, or by those whom we admire or who admire us. And also those with whom it is pleasant to live and spend our days: such are the good-tempered, and those who are not too ready to show us our mistakes, and those who are not cantankerous or quarrelsome – such people are always wanting to fight us, and those who fight us we feel wish for the opposite of what we wish for ourselves – and those who have the tact to make and take a joke; here both parties have the same object in view, when they can stand being made fun of as well as do it prettily themselves. And we also feel friendly towards those who praise such good qualities as we possess, and especially if they praise the good qualities that we are not too sure we do possess. And towards those who are cleanly in their person, their dress, and all their way of life. And towards those who do not reproach us with what we have done amiss to them or they have done to help us, for both actions show a tendency to criticize us. And towards those who do not nurse grudges or store up grievances, but are always ready to make friends again; for we take it that they will behave to us just as we find them behaving to every one else. And towards those who are not evil speakers and who are aware of neither their neighbours' bad points nor our own, but of our good ones only, as a good man always will be. And towards those who do not try to thwart us when we are angry or in earnest, which would mean being ready to fight us. And towards those who have some serious feeling towards us, such as admiration for us, or belief in our goodness, or pleasure in our company; especially if they feel like this about qualities in us for which we especially wish to be admired, esteemed, or liked. And towards those who are like ourselves in character and occupation, provided they do not get in our way or gain their living from the same source as we do – for then it will be a case of 'potter against potter':

Potter to potter and builder to builder begrudge their reward. And those who desire the same things as we desire, if it is possible for us

both to share them together; otherwise the same trouble arises here too. And towards those with whom we are on such terms that, while we respect their opinions, we need not blush before them for doing what is conventionally wrong: as well as towards those before whom we should be ashamed to do anything really wrong. Again, our rivals, and those whom we should like to envy us – though without ill-feeling – either we like these people or at least we wish them to like us. And we feel friendly towards those whom we help to secure good for themselves, provided we are not likely to suffer heavily by it ourselves. And those who feel as friendly to us when we are not with them as when we are – which is why all men feel friendly towards those who are faithful to their dead friends. And, speaking generally, towards those who are really fond of their friends and do not desert them in trouble; of all good men, we feel most friendly to those who show their goodness as friends. Also towards those who are honest with us, including those who will tell us of their own weak points: it has just said that with our friends we are not ashamed of what is conventionally wrong, and if we do have this feeling, we do not love them; if therefore we do not have it, it looks as if we did love them. We also like those with whom we do not feel frightened or uncomfortable – nobody can like a man of whom he feels frightened. Friendship has various forms – comradeship, intimacy, kinship, and so on.

Things that cause friendship are: doing kindnesses; doing them unasked; and not proclaiming the fact when they are done, which shows that they were done for our own sake and not for some other reason.

Enmity and Hatred should clearly be studied by reference to their opposites. Enmity may be produced by anger or spite or calumny. Now whereas anger arises from offences against oneself, enmity may arise even without that; we may hate people merely because of what we take to be their character. Anger is always concerned with individuals – a Callias or a Socrates – whereas hatred is directed also against classes: we all hate any thief and any informer. Moreover, anger can be cured by time; but hatred cannot. The one aims at giving pain to its object, the other at doing him harm; the angry man

wants his victims to feel; the hater does not mind whether they feel or not. All painful things are felt; but the greatest evils, injustice and folly, are the least felt, since their presence causes no pain. And anger is accompanied by pain, hatred is not; the angry man feels pain, but the hater does not. Much may happen to make the angry man pity those who offend him, but the hater under no circumstances wishes to pity a man whom he has once hated: for the one would have the offenders suffer for what they have done; the other would have them cease to exist.

It is plain from all this that we can prove people to be friends or enemies; if they are not, we can make them out to be so; if they claim to be so, we can refute their claim; and if it is disputed whether an action was due to anger or to hatred, we can attribute it to whichever of these we prefer.

5

To turn next to Fear, what follows will show things and persons of which, and the states of mind in which, we feel afraid. Fear may be defined as a pain or disturbance due to a mental picture of some destructive or painful evil in the future. Of destructive or painful evils only; for there are some evils, e.g. wickedness or stupidity, the prospect of which does not frighten us: I mean only such as amount to great pains or losses. And even these only if they appear not remote but so near as to be imminent: we do not fear things that are a very long way off: for instance, we all know we shall die, but we are not troubled thereby, because death is not close at hand. From this definition it will follow that fear is caused by whatever we feel has great power of destroying or of harming us in ways that tend to cause us great pain. Hence the very indications of such things are terrible, making us feel that the terrible thing itself is close at hand; the approach of what is terrible is just what we mean by 'danger'. Such indications are the enmity and anger of people who have power to do something to us; for it is plain that they have the will to do it, and so

they are on the point of doing it. Also injustice in possession of power; for it is the unjust man's will to do evil that makes him unjust. Also outraged virtue in possession of power; for it is plain that, when outraged, it always has the will to retaliate, and now it has the power to do so. Also fear felt by those who have the power to do something to us, since such persons are sure to be ready to do it. And since most men tend to be bad – slaves to greed, and cowards in danger – it is, as a rule, a terrible thing to be at another man's mercy; and therefore, if we have done anything horrible, those in the secret terrify us with the thought that they may betray or desert us. And those who can do us wrong are terrible to us when we are liable to be wronged; for as a rule men do wrong to others whenever they have the power to do it. And those who have been wronged, or believe themselves to be wronged, are terrible; for they are always looking out for their opportunity. Also those who have done people wrong, if they possess power, since they stand in fear of retaliation: we have already said that wickedness possessing power is terrible. Again, our rivals for a thing cause us fear when we cannot both have it at once; for we are always at war with such men. We also fear those who are to be feared by stronger people than ourselves: if they can hurt those stronger people, still more can they hurt us; and, for the same reason, we fear those whom those stronger people are actually afraid of. Also those who have destroyed people stronger than we are. Also those who are attacking people weaker than we are: either they are already formidable, or they will be so when they have thus grown stronger. Of those we have wronged, and of our enemies or rivals, it is not the passionate and outspoken whom we have to fear, but the quiet, dissembling, unscrupulous; since we never know when they are upon us, we can never be sure they are at a safe distance. All terrible things are more terrible if they give us no chance of retrieving a blunder either no chance at all, or only one that depends on our enemies and not ourselves. Those things are also worse which we cannot, or cannot easily, help. Speaking generally, anything causes us to feel fear that when it happens to, or threatens, others cause us to feel pity.

The above are, roughly, the chief things that are terrible and are feared. Let us now describe the conditions under which we ourselves

feel fear. If fear is associated with the expectation that something destructive will happen to us, plainly nobody will be afraid who believes nothing can happen to him; we shall not fear things that we believe cannot happen to us, nor people who we believe cannot inflict them upon us; nor shall we be afraid at times when we think ourselves safe from them. It follows therefore that fear is felt by those who believe something to be likely to happen to them, at the hands of particular persons, in a particular form, and at a particular time. People do not believe this when they are, or think they a are, in the midst of great prosperity, and are in consequence insolent, contemptuous, and reckless – the kind of character produced by wealth, physical strength, abundance of friends, power: nor yet when they feel they have experienced every kind of horror already and have grown callous about the future, like men who are being flogged and are already nearly dead – if they are to feel the anguish of uncertainty, there must be some faint expectation of escape. This appears from the fact that fear sets us thinking what can be done, which of course nobody does when things are hopeless. Consequently, when it is advisable that the audience should be frightened, the orator must make them feel that they really are in danger of something, pointing out that it has happened to others who were stronger than they are, and is happening, or has happened, to people like themselves, at the hands of unexpected people, in an unexpected form, and at an unexpected time.

Having now seen the nature of fear, and of the things that cause it, and the various states of mind in which it is felt, we can also see what Confidence is, about what things we feel it, and under what conditions. It is the opposite of fear, and what causes it is the opposite of what causes fear; it is, therefore, the expectation associated with a mental picture of the nearness of what keeps us safe and the absence or remoteness of what is terrible: it may be due either to the near presence of what inspires confidence or to the absence of what causes alarm. We feel it if we can take steps – many, or important, or both – to cure or prevent trouble; if we have neither wronged others nor been wronged by them; if we have either no rivals at all or no strong ones; if our rivals who are strong are our friends or have treated us well or been treated well by us; or if those

whose interest is the same as ours are the more numerous party, or the stronger, or both.

As for our own state of mind, we feel confidence if we believe we have often succeeded and never suffered reverses, or have often met danger and escaped it safely. For there are two reasons why human beings face danger calmly: they may have no experience of it, or they may have means to deal with it: thus when in danger at sea people may feel confident about what will happen either because they have no experience of bad weather, or because their experience gives them the means of dealing with it. We also feel confident whenever there is nothing to terrify other people like ourselves, or people weaker than ourselves, or people than whom we believe ourselves to be stronger – and we believe this if we have conquered them, or conquered others who are as strong as they are, or stronger. Also if we believe ourselves superior to our rivals in the number and importance of the advantages that make men formidable – wealth, physical strength, strong bodies of supporters, extensive territory, and the possession of all, or the most important, appliances of war. Also if we have wronged no one, or not many, or not those of whom we are afraid; and generally, if our relations with the gods are satisfactory, as will be shown especially by signs and oracles. The fact is that anger makes us confident – that anger is excited by our knowledge that we are not the wrongers but the wronged, and that the divine power is always supposed to be on the side of the wronged. Also when, at the outset of an enterprise, we believe that we cannot and shall not fail, or that we shall succeed completely. – So much for the causes of fear and confidence.

6

We now turn to Shame and Shamelessness; what follows will explain the things that cause these feelings, and the persons before whom, and the states of mind under which, they are felt. Shame may be defined as pain or disturbance in regard to bad things, whether

present, past, or future, which seem likely to involve us in discredit; and shamelessness as contempt or indifference in regard to these same bad things. If this definition be granted, it follows that we feel shame at such bad things as we think are disgraceful to ourselves or to those we care for. These evils are, in the first place, those due to moral badness. Such are throwing away one's shield or taking to flight; for these bad things are due to cowardice. Also, withholding a deposit or otherwise wronging people about money; for these acts are due to injustice. Also, having carnal intercourse with forbidden persons, at wrong times, or in wrong places; for these things are due to licentiousness. Also, making profit in petty or disgraceful ways, or out of helpless persons, e.g. the poor, or the dead – whence the proverb 'He would pick a corpse's pocket'; for all this is due to low greed and meanness. Also, in money matters, giving less help than you might, or none at all, or accepting help from those worse off than yourself; so also borrowing when it will seem like begging; begging when it will seem like asking the return of a favour; asking such a return when it will seem like begging; praising a man in order that it may seem like begging; and going on begging in spite of failure: all such actions are tokens of meanness. Also, praising people to their face, and praising extravagantly a man's good points and glozing over his weaknesses, and showing extravagant sympathy with his grief when you are in his presence, and all that sort of thing; all this shows the disposition of a flatterer. Also, refusing to endure hardships that are endured by people who are older, more delicately brought up, of higher rank, or generally less capable of endurance than ourselves: for all this shows effeminacy. Also, accepting benefits, especially accepting them often, from another man, and then abusing him for conferring them: all this shows a mean, ignoble disposition. Also, talking incessantly about yourself, making loud professions, and appropriating the merits of others; for this is due to boastfulness. The same is true of the actions due to any of the other forms of badness of moral character, of the tokens of such badness, &c.: they are all disgraceful and shameless. Another sort of bad thing at which we feel shame is, lacking a share in the honourable things shared by every one else, or by all or nearly all who are like ourselves. By 'those like ourselves' I mean those of our own race or country or age or family,

and generally those who are on our own level. Once we are on a level with others, it is a disgrace to be, say, less well educated than they are; and so with other advantages: all the more so, in each case, if it is seen to be our own fault: wherever we are ourselves to blame for our present, past, or future circumstances, it follows at once that this is to a greater extent due to our moral badness. We are moreover ashamed of having done to us, having had done, or being about to have done to us acts that involve us in dishonour and reproach; as when we surrender our persons, or lend ourselves to vile deeds, e.g. when we submit to outrage. And acts of yielding to the lust of others are shameful whether willing or unwilling (yielding to force being an instance of unwillingness), since unresisting submission to them is due to unmanliness or cowardice.

These things, and others like them, are what cause the feeling of shame. Now since shame is a mental picture of disgrace, in which we shrink from the disgrace itself and not from its consequences, and we only care what opinion is held of us because of the people who form that opinion, it follows that the people before whom we feel shame are those whose opinion of us matters to us. Such persons are: those who admire us, those whom we admire, those by whom we wish to be admired, those with whom we are competing, and those whose opinion of us we respect. We admire those, and wish those to admire us, who possess any good thing that is highly esteemed; or from whom we are very anxious to get something that they are able to give us – as a lover feels. We compete with our equals. We respect, as true, the views of sensible people, such as our elders and those who have been well educated. And we feel more shame about a thing if it is done openly, before all men's eyes. Hence the proverb, 'shame dwells in the eyes'. For this reason we feel most shame before those who will always be with us and those who notice what we do, since in both cases eyes are upon us. We also feel it before those not open to the same imputation as ourselves: for it is plain that their opinions about it are the opposite of ours. Also before those who are hard on any one whose conduct they think wrong; for what a man does himself, he is said not to resent when his neighbours do it: so that of course he does resent their doing what he does not do himself. And before those who are likely to tell everybody

about you; not telling others is as good as not be lieving you wrong. People are likely to tell others about you if you have wronged them, since they are on the look out to harm you; or if they speak evil of everybody, for those who attack the innocent will be still more ready to attack the guilty. And before those whose main occupation is with their neighbours' failings – people like satirists and writers of comedy; these are really a kind of evil-speakers and tell-tales. And before those who have never yet known us come to grief, since their attitude to us has amounted to admiration so far: that is why we feel ashamed to refuse those a favour who ask one for the first time – we have not as yet lost credit with them. Such are those who are just beginning to wish to be our friends; for they have seen our best side only (hence the appropriateness of Euripides' reply to the Syracusans): and such also are those among our old acquaintances who know nothing to our discredit. And we are ashamed not merely of the actual shameful conduct mentioned, but also of the evidences of it: not merely, for example, of actual sexual intercourse, but also of its evidences; and not merely of disgraceful acts but also of disgraceful talk. Similarly we feel shame not merely in presence of the persons mentioned but also of those who will tell them what we have done, such as their servants or friends. And, generally, we feel no shame before those upon whose opinions we quite look down as untrustworthy (no one feels shame before small children or animals); nor are we ashamed of the same things before intimates as before strangers, but before the former of what seem genuine faults, before the latter of what seem conventional ones.

The conditions under which we shall feel shame are these: first, having people related to us like those before whom, as has been said, we feel shame. These are, as was stated, persons whom we admire, or who admire us, or by whom we wish to be admired, or from whom we desire some service that we shall not obtain if we forfeit their good opinion. These persons may be actually looking on (as Cydias represented them in his speech on land assignments in Samos, when he told the Athenians to imagine the Greeks to be standing all around them, actually seeing the way they voted and not merely going to hear about it afterwards): or again they may be near at hand, or may be likely to find out about what we do. This is why in

misfortune we do not wish to be seen by those who once wished themselves like us; for such a feeling implies admiration. And men feel shame when they have acts or exploits to their credit on which they are bringing dishonour, whether these are their own, or those of their ancestors, or those of other persons with whom they have some close connexion. Generally, we feel shame before those for whose own misconduct we should also feel it – those already mentioned; those who take us as their models; those whose teachers or advisers we have been; or other people, it may be, like ourselves, whose rivals we are. For there are many things that shame before such people makes us do or leave undone. And we feel more shame when we are likely to be continually seen by, and go about under the eyes of, those who know of our disgrace. Hence, when Antiphon the poet was to be cudgelled to death by order of Dionysius, and saw those who were to perish with him covering their faces as they went through the gates, he said, 'Why do you cover your faces? Is it lest some of these spectators should see you to-morrow?'

So much for Shame; to understand Shamelessness, we need only consider the converse cases, and plainly we shall have all we need.

7

To take Kindness next: the definition of it will show us towards whom it is felt, why, and in what frames of mind. Kindness – under the influence of which a man is said to 'be kind' may be defined as helpfulness towards some one in need, not in return for anything, nor for the advantage of the helper himself, but for that of the person helped. Kindness is great if shown to one who is in great need, or who needs what is important and hard to get, or who needs it at an important and difficult crisis; or if the helper is the only, the first, or the chief person to give the help. Natural cravings constitute such needs; and in particular cravings, accompanied by pain, for what is not being attained. The appetites are cravings for this kind: sexual desire, for instance, and those which arise during bodily injuries and

in dangers; for appetite is active both in danger and in pain. Hence those who stand by us in poverty or in banishment, even if they do not help us much, are yet really kind to us, because our need is great and the occasion pressing; for instance, the man who gave the mat in the Lyceum. The helpfulness must therefore meet, preferably, just this kind of need; and failing just this kind, some other kind as great or greater. We now see to whom, why, and under what conditions kindness is shown; and these facts must form the basis of our arguments. We must show that the persons helped are, or have been, in such pain and need as has been described, and that their helpers gave, or are giving, the kind of help described, in the kind of need described. We can also see how to eliminate the idea of kindness and make our opponents appear unkind: we may maintain that they are being or have been helpful simply to promote their own interest – this, as has been stated, is not kindness; or that their action was accidental, or was forced upon them; or that they were not doing a favour, but merely returning one, whether they know this or not – in either case the action is a mere return, and is therefore not a kindness even if the doer does not know how the case stands. In considering this subject we must look at all the categories: an act may be an act of kindness because (1) it is a particular thing, (2) it has a particular magnitude or (3) quality, or (4) is done at a particular time or (5) place. As evidence of the want of kindness, we may point out that a smaller service had been refused to the man in need; or that the same service, or an equal or greater one, has been given to his enemies; these facts show that the service in question was not done for the sake of the person helped. Or we may point out that the thing desired was worthless and that the helper knew it: no one will admit that he is in need of what is worthless.

8

So much for Kindness and Unkindness. Let us now consider Pity, asking ourselves what things excite pity, and for what persons, and in what states of our mind pity is felt. Pity may be defined as a

feeling of pain caused by the sight of some evil, destructive or painful, which befalls one who does not deserve it, and which we might expect to befall ourselves or some friend of ours, and moreover to befall us soon. In order to feel pity, we must obviously be capable of supposing that some evil may happen to us or some friend of ours, and moreover some such evil as is stated in our definition or is more or less of that kind. It is therefore not felt by those completely ruined, who suppose that no further evil can befall them, since the worst has befallen them already; nor by those who imagine themselves immensely fortunate – their feeling is rather presumptuous insolence, for when they think they possess all the good things of life, it is clear that the impossibility of evil befalling them will be included, this being one of the good things in question. Those who think evil may befall them are such as have already had it befall them and have safely escaped from it; elderly men, owing to their good sense and their experience; weak men, especially men inclined to cowardice; and also educated people, since these can take long views. Also those who have parents living, or children, or wives; for these are our own, and the evils mentioned above may easily befall them. And those who neither moved by any courageous emotion such as anger or confidence (these emotions take no account of the future), nor by a disposition to presumptuous insolence (insolent men, too, take no account of the possibility that something evil will happen to them), nor yet by great fear (panic-stricken people do not feel pity, because they are taken up with what is happening to themselves); only those feel pity who are between these two extremes. In order to feel pity we must also believe in the goodness of at least some people; if you think nobody good, you will believe that everybody deserves evil fortune. And, generally, we feel pity whenever we are in the condition of remembering that similar misfortunes have happened to us or ours, or expecting them to happen in the future.

So much for the mental conditions under which we feel pity. What we pity is stated clearly in the definition. All unpleasant and painful things excite pity if they tend to destroy pain and annihilate; and all such evils as are due to chance, if they are serious. The painful and destructive evils are: death in its various forms, bodily injuries and

afflictions, old age, diseases, lack of food. The evils due to chance are: friendlessness, scarcity of friends (it is a pitiful thing to be torn away from friends and companions), deformity, weakness, mutilation; evil coming from a source from which good ought to have come; and the frequent repetition of such misfortunes. Also the coming of good when the worst has happened: e.g. the arrival of the Great King's gifts for Diopeithes after his death. Also that either no good should have befallen a man at all, or that he should not be able to enjoy it when it has.

The grounds, then, on which we feel pity are these or like these. The people we pity are: those whom we know, if only they are not very closely related to us – in that case we feel about them as if we were in danger ourselves. For this reason Amasis did not weep, they say, at the sight of his son being led to death, but did weep when he saw his friend begging: the latter sight was pitiful, the former terrible, and the terrible is different from the pitiful; it tends to cast out pity, and often helps to produce the opposite of pity. Again, we feel pity when the danger is near ourselves. Also we pity those who are like us in age, character, disposition, social standing, or birth; for in all these cases it appears more likely that the same misfortune may befall us also. Here too we have to remember the general principle that what we fear for ourselves excites our pity when it happens to others. Further, since it is when the sufferings of others are close to us that they excite our pity (we cannot remember what disasters happened a hundred centuries ago, nor look forward to what will happen a hundred centuries hereafter, and therefore feel little pity, if any, for such things): it follows that those who heighten the effect of their words with suitable gestures, tones, dress, and dramatic action generally, are especially successful in exciting pity: they thus put the disasters before our eyes, and make them seem close to us, just coming or just past. Anything that has just happened, or is going to happen soon, is particularly piteous: so too therefore are the tokens and the actions of sufferers – the garments and the like of those who have already suffered; the words and the like of those actually suffering – of those, for instance, who are on the point of death. Most piteous of all is it when, in such times of trial, the victims are persons of noble character: whenever they are so, our pity is especially

excited, because their innocence, as well as the setting of their misfortunes before our eyes, makes their misfortunes seem close to ourselves.

9

Most directly opposed to pity is the feeling called Indignation. Pain at unmerited good fortune is, in one sense, opposite to pain at unmerited bad fortune, and is due to the same moral qualities. Both feelings are associated with good moral character; it is our duty both to feel sympathy and pity for unmerited distress, and to feel indignation at unmerited prosperity; for whatever is undeserved is unjust, and that is why we ascribe indignation even to the gods. It might indeed be thought that envy is similarly opposed to pity, on the ground that envy it closely akin to indignation, or even the same thing. But it is not the same. It is true that it also is a disturbing pain excited by the prosperity of others. But it is excited not by the prosperity of the undeserving but by that of people who are like us or equal with us. The two feelings have this in common, that they must be due not to some untoward thing being likely to befall ourselves, but only to what is happening to our neighbour. The feeling ceases to be envy in the one case and indignation in the other, and becomes fear, if the pain and disturbance are due to the prospect of something bad for ourselves as the result of the other man's good fortune. The feelings of pity and indignation will obviously be attended by the converse feelings of satisfaction. If you are pained by the unmerited distress of others, you will be pleased, or at least not pained, by their merited distress. Thus no good man can be pained by the punishment of parricides or murderers. These are things we are bound to rejoice at, as we must at the prosperity of the deserving; both these things are just, and both give pleasure to any honest man, since he cannot help expecting that what has happened to a man like him will happen to him too. All these feelings are associated with the same type of moral character. And their contraries are associated with the contrary type; the man who is delighted by others'

misfortunes is identical with the man who envies others' prosperity. For any one who is pained by the occurrence or existence of a given thing must be pleased by that thing's non-existence or destruction. We can now see that all these feelings tend to prevent pity (though they differ among themselves, for the reasons given), so that all are equally useful for neutralizing an appeal to pity.

We will first consider Indignation – reserving the other emotions for subsequent discussion – and ask with whom, on what grounds, and in what states of mind we may be indignant. These questions are really answered by what has been said already. Indignation is pain caused by the sight of undeserved good fortune. It is, then, plain to begin with that there are some forms of good the sight of which cannot cause it. Thus a man may be just or brave, or acquire moral goodness: but we shall not be indignant with him for that reason, any more than we shall pity him for the contrary reason. Indignation is roused by the sight of wealth, power, and the like – by all those things, roughly speaking, which are deserved by good men and by those who possess the goods of nature – noble birth, beauty, and so on. Again, what is long established seems akin to what exists by nature; and therefore we feel more indignation at those possessing a given good if they have as a matter of fact only just got it and the prosperity it brings with it. The newly rich give more offence than those whose wealth is of long standing and inherited. The same is true of those who have office or power, plenty of friends, a fine family, &c. We feel the same when these advantages of theirs secure them others. For here again, the newly rich give us more offence by obtaining office through their riches than do those whose wealth is of long standing; and so in all other cases. The reason is that what the latter have is felt to be really their own, but what the others have is not; what appears to have been always what it is is regarded as real, and so the possessions of the newly rich do not seem to be really their own. Further, it is not any and every man that deserves any given kind of good; there is a certain correspondence and appropriateness in such things; thus it is appropriate for brave men, not for just men, to have fine weapons, and for men of family, not for parvenus, to make distinguished marriages. Indignation may therefore properly be felt when any one gets what is not appropriate

for him, though he may be a good man enough. It may also be felt when any one sets himself up against his superior, especially against his superior in some particular respect – whence the lines

Only from battle he shrank with Aias Telamon's son;

Zeus had been angered with him,

had he fought with a mightier one; but also, even apart from that, when the inferior in any sense contends with his superior; a musician, for instance, with a just man, for justice is a finer thing than music.

Enough has been said to make clear the grounds on which, and the persons against whom, Indignation is felt – they are those mentioned, and others like him. As for the people who feel it; we feel it if we do ourselves deserve the greatest possible goods and moreover have them, for it is an injustice that those who are not our equals should have been held to deserve as much as we have. Or, secondly, we feel it if we are really good and honest people; our judgement is then sound, and we loathe any kind of injustice. Also if we are ambitious and eager to gain particular ends, especially if we are ambitious for what others are getting without deserving to get it. And, generally, if we think that we ourselves deserve a thing and that others do not, we are disposed to be indignant with those others so far as that thing is concerned. Hence servile, worthless, unambitious persons are not inclined to Indignation, since there is nothing they can believe themselves to deserve.

From all this it is plain what sort of men those are at whose misfortunes, distresses, or failures we ought to feel pleased, or at least not pained: by considering the facts described we see at once what their contraries are. If therefore our speech puts the judges in such a frame of mind as that indicated and shows that those who claim pity on certain definite grounds do not deserve to secure pity but do deserve not to secure it, it will be impossible for the judges to feel pity.

10

To take Envy next: we can see on what grounds, against what persons, and in what states of mind we feel it. Envy is pain at the sight of such good fortune as consists of the good things already mentioned; we feel it towards our equals; not with the idea of getting something for ourselves, but because the other people have it. We shall feel it if we have, or think we have, equals; and by 'equals' I mean equals in birth, relationship, age, disposition, distinction, or wealth. We feel envy also if we fall but a little short of having everything; which is why people in high place and prosperity feel it – they think every one else is taking what belongs to themselves. Also if we are exceptionally distinguished for some particular thing, and especially if that thing is wisdom or good fortune. Ambitious men are more envious than those who are not. So also those who profess wisdom; they are ambitious to be thought wise. Indeed, generally, those who aim at a reputation for anything are envious on this particular point. And small-minded men are envious, for everything seems great to them. The good things which excite envy have already been mentioned. The deeds or possessions which arouse the love of reputation and honour and the desire for fame, and the various gifts of fortune, are almost all subject to envy; and particularly if we desire the thing ourselves, or think we are entitled to it, or if having it puts us a little above others, or not having it a little below them. It is clear also what kind of people we envy; that was included in what has been said already: we envy those who are near us in time, place, age, or reputation. Hence the line:

Ay, kin can even be jealous of their kin. Also our fellow-competitors, who are indeed the people just mentioned – we do not compete with men who lived a hundred centuries ago, or those not yet born, or the dead, or those who dwell near the Pillars of Hercules, or those whom, in our opinion or that of others, we take to be far below us or far above us. So too we compete with those who follow the same ends as ourselves: we compete with our rivals in sport or in love, and generally with those who are after the same things; and it is

therefore these whom we are bound to envy beyond all others. Hence the saying:

Potter against potter. We also envy those whose possession of or success in a thing is a reproach to us: these are our neighbours and equals; for it is clear that it is our own fault we have missed the good thing in question; this annoys us, and excites envy in us. We also envy those who have what we ought to have, or have got what we did have once. Hence old men envy younger men, and those who have spent much envy those who have spent little on the same thing. And men who have not got a thing, or not got it yet, envy those who have got it quickly. We can also see what things and what persons give pleasure to envious people, and in what states of mind they feel it: the states of mind in which they feel pain are those under which they will feel pleasure in the contrary things. If therefore we ourselves with whom the decision rests are put into an envious state of mind, and those for whom our pity, or the award of something desirable, is claimed are such as have been described, it is obvious that they will win no pity from us.

11

We will next consider Emulation, showing in what follows its causes and objects, and the state of mind in which it is felt. Emulation is pain caused by seeing the presence, in persons whose nature is like our own, of good things that are highly valued and are possible for ourselves to acquire; but it is felt not because others have these goods, but because we have not got them ourselves. It is therefore a good feeling felt by good persons, whereas envy is a bad feeling felt by bad persons. Emulation makes us take steps to secure the good things in question, envy makes us take steps to stop our neighbour having them. Emulation must therefore tend to be felt by persons who believe themselves to deserve certain good things that they have not got, it being understood that no one aspires to things which appear impossible. It is accordingly felt by the young and by persons

of lofty disposition. Also by those who possess such good things as are deserved by men held in honour – these are wealth, abundance of friends, public office, and the like; on the assumption that they ought to be good men, they are emulous to gain such goods because they ought, in their belief, to belong to men whose state of mind is good. Also by those whom all others think deserving. We also feel it about anything for which our ancestors, relatives, personal friends, race, or country are specially honoured, looking upon that thing as really our own, and therefore feeling that we deserve to have it. Further, since all good things that are highly honoured are objects of emulation, moral goodness in its various forms must be such an object, and also all those good things that are useful and serviceable to others: for men honour those who are morally good, and also those who do them service. So with those good things our possession of which can give enjoyment to our neighbours – wealth and beauty rather than health. We can see, too, what persons are the objects of the feeling. They are those who have these and similar things – those already mentioned, as courage, wisdom, public office. Holders of public office – generals, orators, and all who possess such powers – can do many people a good turn. Also those whom many people wish to be like; those who have many acquaintances or friends; those whom admire, or whom we ourselves admire; and those who have been praised and eulogized by poets or prose-writers. Persons of the contrary sort are objects of contempt: for the feeling and notion of contempt are opposite to those of emulation. Those who are such as to emulate or be emulated by others are inevitably disposed to be contemptuous of all such persons as are subject to those bad things which are contrary to the good things that are the objects of emulation: despising them for just that reason. Hence we often despise the fortunate, when luck comes to them without their having those good things which are held in honour.

This completes our discussion of the means by which the several emotions may be produced or dissipated, and upon which depend the persuasive arguments connected with the emotions.

12

Let us now consider the various types of human character, in relation to the emotions and moral qualities, showing how they correspond to our various ages and fortunes. By emotions I mean anger, desire, and the like; these we have discussed already. By moral qualities I mean virtues and vices; these also have been discussed already, as well as the various things that various types of men tend to will and to do. By ages I mean youth, the prime of life, and old age. By fortune I mean birth, wealth, power, and their opposites – in fact, good fortune and ill fortune.

To begin with the Youthful type of character. Young men have strong passions, and tend to gratify them indiscriminately. Of the bodily desires, it is the sexual by which they are most swayed and in which they show absence of self-control. They are changeable and fickle in their desires, which are violent while they last, but quickly over: their impulses are keen but not deep-rooted, and are like sick people's attacks of hunger and thirst. They are hot-tempered, and quick-tempered, and apt to give way to their anger; bad temper often gets the better of them, for owing to their love of honour they cannot bear being slighted, and are indignant if they imagine themselves unfairly treated. While they love honour, they love victory still more; for youth is eager for superiority over others, and victory is one form of this. They love both more than they love money, which indeed they love very little, not having yet learnt what it means to be without it – this is the point of Pittacus' remark about Amphiaraus. They look at the good side rather than the bad, not having yet witnessed many instances of wickedness. They trust others readily, because they have not yet often been cheated. They are sanguine; nature warms their blood as though with excess of wine; and besides that, they have as yet met with few disappointments. Their lives are mainly spent not in memory but in expectation; for expectation refers to the future, memory to the past, and youth has a long future before it and a short past behind it: on the first day of one's life one has nothing at all to remember, and can only look forward. They are easily cheated, owing

to the sanguine disposition just mentioned. Their hot tempers and hopeful dispositions make them more courageous than older men are; the hot temper prevents fear, and the hopeful disposition creates confidence; we cannot feel fear so long as we are feeling angry, and any expectation of good makes us confident. They are shy, accepting the rules of society in which they have been trained, and not yet believing in any other standard of honour. They have exalted notions, because they have not yet been humbled by life or learnt its necessary limitations; moreover, their hopeful disposition makes them think themselves equal to great things – and that means having exalted notions. They would always rather do noble deeds than useful ones: their lives are regulated more by moral feeling than by reasoning; and whereas reasoning leads us to choose what is useful, moral goodness leads us to choose what is noble. They are fonder of their friends, intimates, and companions than older men are, because they like spending their days in the company of others, and have not yet come to value either their friends or anything else by their usefulness to themselves. All their mistakes are in the direction of doing things excessively and vehemently. They disobey Chilon's precept by overdoing everything, they love too much and hate too much, and the same thing with everything else. They think they know everything, and are always quite sure about it; this, in fact, is why they overdo everything. If they do wrong to others, it is because they mean to insult them, not to do them actual harm. They are ready to pity others, because they think every one an honest man, or anyhow better than he is: they judge their neighbour by their own harmless natures, and so cannot think he deserves to be treated in that way. They are fond of fun and therefore witty, wit being well-bred insolence.

13

Such, then is the character of the Young. The character of Elderly Men – men who are past their prime – may be said to be formed for the most part of elements that are the contrary of all these. They have

lived many years; they have often been taken in, and often made mistakes; and life on the whole is a bad business. The result is that they are sure about nothing and under-do everything. They 'think', but they never 'know'; and because of their hesitation they always add a 'possibly'or a 'perhaps', putting everything this way and nothing positively. They are cynical; that is, they tend to put the worse construction on everything. Further, their experience makes them distrustful and therefore suspicious of evil. Consequently they neither love warmly nor hate bitterly, but following the hint of Bias they love as though they will some day hate and hate as though they will some day love. They are small-minded, because they have been humbled by life: their desires are set upon nothing more exalted or unusual than what will help them to keep alive. They are not generous, because money is one of the things they must have, and at the same time their experience has taught them how hard it is to get and how easy to lose. They are cowardly, and are always anticipating danger; unlike that of the young, who are warm-blooded, their temperament is chilly; old age has paved the way for cowardice; fear is, in fact, a form of chill. They love life; and all the more when their last day has come, because the object of all desire is something we have not got, and also because we desire most strongly that which we need most urgently. They are too fond of themselves; this is one form that small-mindedness takes. Because of this, they guide their lives too much by considerations of what is useful and too little by what is noble – for the useful is what is good for oneself, and the noble what is good absolutely. They are not shy, but shameless rather; caring less for what is noble than for what is useful, they feel contempt for what people may think of them. They lack confidence in the future; partly through experience – for most things go wrong, or anyhow turn out worse than one expects; and partly because of their cowardice. They live by memory rather than by hope; for what is left to them of life is but little as compared with the long past; and hope is of the future, memory of the past. This, again, is the cause of their loquacity; they are continually talking of the past, because they enjoy remembering it. Their fits of anger are sudden but feeble. Their sensual passions have either altogether gone or have lost their vigour: consequently they do not feel their passions much, and their actions are inspired

less by what they do feel than by the love of gain. Hence men at this time of life are often supposed to have a self-controlled character; the fact is that their passions have slackened, and they are slaves to the love of gain. They guide their lives by reasoning more than by moral feeling; reasoning being directed to utility and moral feeling to moral goodness. If they wrong others, they mean to injure them, not to insult them. Old men may feel pity, as well as young men, but not for the same reason. Young men feel it out of kindness; old men out of weakness, imagining that anything that befalls any one else might easily happen to them, which, as we saw, is a thought that excites pity. Hence they are querulous, and not disposed to jesting or laughter – the love of laughter being the very opposite of querulousness.

Such are the characters of Young Men and Elderly Men. People always think well of speeches adapted to, and reflecting, their own character: and we can now see how to compose our speeches so as to adapt both them and ourselves to our audiences.

14

As for Men in their Prime, clearly we shall find that they have a character between that of the young and that of the old, free from the extremes of either. They have neither that excess of confidence which amounts to rashness, nor too much timidity, but the right amount of each. They neither trust everybody nor distrust everybody, but judge people correctly. Their lives will be guided not by the sole consideration either of what is noble or of what is useful, but by both; neither by parsimony nor by prodigality, but by what is fit and proper. So, too, in regard to anger and desire; they will be brave as well as temperate, and temperate as well as brave; these virtues are divided between the young and the old; the young are brave but intemperate, the old temperate but cowardly. To put it generally, all the valuable qualities that youth and age divide between them are united in the prime of life, while all their excesses or defects are replaced by

moderation and fitness. The body is in its prime from thirty to five-and-thirty; the mind about forty-nine.

15

So much for the types of character that distinguish youth, old age, and the prime of life. We will now turn to those Gifts of Fortune by which human character is affected. First let us consider Good Birth. Its effect on character is to make those who have it more ambitious; it is the way of all men who have something to start with to add to the pile, and good birth implies ancestral distinction. The well-born man will look down even on those who are as good as his own ancestors, because any far-off distinction is greater than the same thing close to us, and better to boast about. Being well-born, which means coming of a fine stock, must be distinguished from nobility, which means being true to the family nature – a quality not usually found in the well-born, most of whom are poor creatures. In the generations of men as in the fruits of the earth, there is a varying yield; now and then, where the stock is good, exceptional men are produced for a while, and then decadence sets in. A clever stock will degenerate towards the insane type of character, like the descendants of Alcibiades or of the elder Dionysius; a steady stock towards the fatuous and torpid type, like the descendants of Cimon, Pericles, and Socrates.

16

The type of character produced by Wealth lies on the surface for all to see. Wealthy men are insolent and arrogant; their possession of wealth affects their understanding; they feel as if they had every good thing that exists; wealth becomes a sort of standard of value for everything else, and therefore they imagine there is nothing it cannot

buy. They are luxurious and ostentatious; luxurious, because of the luxury in which they live and the prosperity which they display; ostentatious and vulgar, because, like other people's, their minds are regularly occupied with the object of their love and admiration, and also because they think that other people's idea of happiness is the same as their own. It is indeed quite natural that they should be affected thus; for if you have money, there are always plenty of people who come begging from you. Hence the saying of Simonides about wise men and rich men, in answer to Hiero's wife, who asked him whether it was better to grow rich or wise. 'Why, rich,' he said; 'for I see the wise men spending their days at the rich men's doors.' Rich men also consider themselves worthy to hold public office; for they consider they already have the things that give a claim to office. In a word, the type of character produced by wealth is that of a prosperous fool. There is indeed one difference between the type of the newly-enriched and those who have long been rich: the newly-enriched have all the bad qualities mentioned in an exaggerated and worse form – to be newly-enriched means, so to speak, no education in riches. The wrongs they do others are not meant to injure their victims, but spring from insolence or self-indulgence, e.g. those that end in assault or in adultery.

17

As to Power: here too it may fairly be said that the type of character it produces is mostly obvious enough. Some elements in this type it shares with the wealthy type, others are better. Those in power are more ambitious and more manly in character than the wealthy, because they aspire to do the great deeds that their power permits them to do. Responsibility makes them more serious: they have to keep paying attention to the duties their position involves. They are dignified rather than arrogant, for the respect in which they are held inspires them with dignity and therefore with moderation – dignity being a mild and becoming form of arrogance. If they wrong others, they wrong them not on a small but on a great scale.

Good fortune in certain of its branches produces the types of character belonging to the conditions just described, since these conditions are in fact more or less the kinds of good fortune that are regarded as most important. It may be added that good fortune leads us to gain all we can in the way of family happiness and bodily advantages. It does indeed make men more supercilious and more reckless; but there is one excellent quality that goes with it – piety, and respect for the divine power, in which they believe because of events which are really the result of chance.

This account of the types of character that correspond to differences of age or fortune may end here; for to arrive at the opposite types to those described, namely, those of the poor, the unfortunate, and the powerless, we have only to ask what the opposite qualities are.

18

The use of persuasive speech is to lead to decisions. (When we know a thing, and have decided about it, there is no further use in speaking about it.) This is so even if one is addressing a single person and urging him to do or not to do something, as when we scold a man for his conduct or try to change his views: the single person is as much your 'judge' as if he were one of many; we may say, without qualification, that any one is your judge whom you have to persuade. Nor does it matter whether we are arguing against an actual opponent or against a mere proposition; in the latter case we still have to use speech and overthrow the opposing arguments, and we attack these as we should attack an actual opponent. Our principle holds good of ceremonial speeches also; the 'onlookers' for whom such a speech is put together are treated as the judges of it. Broadly speaking, however, the only sort of person who can strictly be called a judge is the man who decides the issue in some matter of public controversy; that is, in law suits and in political debates, in both of which there are issues to be decided. In the section on political

oratory an account has already been given of the types of character that mark the different constitutions.

The manner and means of investing speeches with moral character may now be regarded as fully set forth.

Each of the main divisions of oratory has, we have seen, its own distinct purpose. With regard to each division, we have noted the accepted views and propositions upon which we may base our arguments – for political, for ceremonial, and for forensic speaking. We have further determined completely by what means speeches may be invested with the required moral character. We are now to proceed to discuss the arguments common to all oratory. All orators, besides their special lines of argument, are bound to use, for instance, the topic of the Possible and Impossible; and to try to show that a thing has happened, or will happen in future. Again, the topic of Size is common to all oratory; all of us have to argue that things are bigger or smaller than they seem, whether we are making political speeches, speeches of eulogy or attack, or prosecuting or defending in the law-courts. Having analysed these subjects, we will try to say what we can about the general principles of arguing by 'enthymeme' and 'example', by the addition of which we may hope to complete the project with which we set out. Of the above-mentioned general lines of argument, that concerned with Amplification is – as has been already said – most appropriate to ceremonial speeches; that concerned with the Past, to forensic speeches, where the required decision is always about the past; that concerned with Possibility and the Future, to political speeches.

19

Let us first speak of the Possible and Impossible. It may plausibly be argued: That if it is possible for one of a pair of contraries to be or happen, then it is possible for the other: e.g. if a man can be cured, he can also fall ill; for any two contraries are equally possible, in so far

as they are contraries. That if of two similar things one is possible, so is the other. That if the harder of two things is possible, so is the easier. That if a thing can come into existence in a good and beautiful form, then it can come into existence generally; thus a house can exist more easily than a beautiful house. That if the beginning of a thing can occur, so can the end; for nothing impossible occurs or begins to occur; thus the commensurability of the diagonal of a square with its side neither occurs nor can begin to occur. That if the end is possible, so is the beginning; for all things that occur have a beginning. That if that which is posterior in essence or in order of generation can come into being, so can that which is prior: thus if a man can come into being, so can a boy, since the boy comes first in order of generation; and if a boy can, so can a man, for the man also is first. That those things are possible of which the love or desire is natural; for no one, as a rule, loves or desires impossibilities. That things which are the object of any kind of science or art are possible and exist or come into existence. That anything is possible the first step in whose production depends on men or things which we can compel or persuade to produce it, by our greater strength, our control of them, or our friendship with them. That where the parts are possible, the whole is possible; and where the whole is possible, the parts are usually possible. For if the slit in front, the toe-piece, and the upper leather can be made, then shoes can be made; and if shoes, then also the front slit and toe-piece. That if a whole genus is a thing that can occur, so can the species; and if the species can occur, so can the genus: thus, if a sailing vessel can be made, so also can a trireme; and if a trireme, then a sailing vessel also. That if one of two things whose existence depends on each other is possible, so is the other; for instance, if 'double', then 'half', and if 'half', then 'double'. That if a thing can be produced without art or preparation, it can be produced still more certainly by the careful application of art to it. Hence Agathon has said:

To some things we by art must needs attain,

Others by destiny or luck we gain.

That if anything is possible to inferior, weaker, and stupider people, it is more so for their opposites; thus Isocrates said that it would be a strange thing if he could not discover a thing that Euthynus had found out. As for Impossibility, we can clearly get what we want by taking the contraries of the arguments stated above.

Questions of Past Fact may be looked at in the following ways: First, that if the less likely of two things has occurred, the more likely must have occurred also. That if one thing that usually follows another has happened, then that other thing has happened; that, for instance, if a man has forgotten a thing, he has also once learnt it. That if a man had the power and the wish to do a thing, he has done it; for every one does do whatever he intends to do whenever he can do it, there being nothing to stop him. That, further, he has done the thing in question either if he intended it and nothing external prevented him; or if he had the power to do it and was angry at the time; or if he had the power to do it and his heart was set upon it – for people as a rule do what they long to do, if they can; bad people through lack of self-control; good people, because their hearts are set upon good things. Again, that if a thing was 'going to happen', it has happened; if a man was 'going to do something', he has done it, for it is likely that the intention was carried out. That if one thing has happened which naturally happens before another or with a view to it, the other has happened; for instance, if it has lightened, it has also thundered; and if an action has been attempted, it has been done. That if one thing has happened which naturally happens after another, or with a view to which that other happens, then that other (that which happens first, or happens with a view to this thing) has also happened; thus, if it has thundered it has lightened, and if an action has been done it has been attempted. Of all these sequences some are inevitable and some merely usual. The arguments for the non-occurrence of anything can obviously be found by considering the opposites of those that have been mentioned.

How questions of Future Fact should be argued is clear from the same considerations: That a thing will be done if there is both the power and the wish to do it; or if along with the power to do it there is a craving for the result, or anger, or calculation, prompting it. That

the thing will be done, in these cases, if the man is actually setting about it, or even if he means to do it later – for usually what we mean to do happens rather than what we do not mean to do. That a thing will happen if another thing which naturally happens before it has already happened; thus, if it is clouding over, it is likely to rain. That if the means to an end have occurred, then the end is likely to occur; thus, if there is a foundation, there will be a house.

For arguments about the Greatness and Smallness of things, the greater and the lesser, and generally great things and small, what we have already said will show the line to take. In discussing deliberative oratory we have spoken about the relative greatness of various goods, and about the greater and lesser in general. Since therefore in each type oratory the object under discussion is some kind of good – whether it is utility, nobleness, or justice – it is clear that every orator must obtain the materials of amplification through these channels. To go further than this, and try to establish abstract laws of greatness and superiority, is to argue without an object; in practical life, particular facts count more than generalizations.

Enough has now been said about these questions of possibility and the reverse, of past or future fact, and of the relative greatness or smallness of things.

20

The special forms of oratorical argument having now been discussed, we have next to treat of those which are common to all kinds of oratory. These are of two main kinds, 'Example' and 'Enthymeme'; for the 'Maxim' is part of an enthymeme.

We will first treat of argument by Example, for it has the nature of induction, which is the foundation of reasoning. This form of argument has two varieties; one consisting in the mention of actual past facts, the other in the invention of facts by the speaker. Of the

latter, again, there are two varieties, the illustrative parallel and the fable (e.g. the fables of Aesop, those from Libya). As an instance of the mention of actual facts, take the following. The speaker may argue thus: 'We must prepare for war against the king of Persia and not let him subdue Egypt. For Darius of old did not cross the Aegean until he had seized Egypt; but once he had seized it, he did cross. And Xerxes, again, did not attack us until he had seized Egypt; but once he had seized it, he did cross. If therefore the present king seizes Egypt, he also will cross, and therefore we must not let him.'

The illustrative parallel is the sort of argument Socrates used: e.g. 'Public officials ought not to be selected by lot. That is like using the lot to select athletes, instead of choosing those who are fit for the contest; or using the lot to select a steersman from among a ship's crew, as if we ought to take the man on whom the lot falls, and not the man who knows most about it.'

Instances of the fable are that of Stesichorus about Phalaris, and that of Aesop in defence of the popular leader. When the people of Himera had made Phalaris military dictator, and were going to give him a bodyguard, Stesichorus wound up a long talk by telling them the fable of the horse who had a field all to himself. Presently there came a stag and began to spoil his pasturage. The horse, wishing to revenge himself on the stag, asked a man if he could help him to do so. The man said, 'Yes, if you will let me bridle you and get on to your back with javelins in my hand'. The horse agreed, and the man mounted; but instead of getting his revenge on the stag, the horse found himself the slave of the man. 'You too', said Stesichorus, 'take care lest your desire for revenge on your enemies, you meet the same fate as the horse. By making Phalaris military dictator, you have already let yourselves be bridled. If you let him get on to your backs by giving him a bodyguard, from that moment you will be his slaves.'

Aesop, defending before the assembly at Samos a poular leader who was being tried for his life, told this story: A fox, in crossing a river, was swept into a hole in the rocks; and, not being able to get out, suffered miseries for a long time through the swarms of fleas that fastened on her. A hedgehog, while roaming around, noticed the fox;

and feeling sorry for her asked if he might remove the fleas. But the fox declined the offer; and when the hedgehog asked why, she replied, ‘These fleas are by this time full of me and not sucking much blood; if you take them away, others will come with fresh appetites and drink up all the blood I have left.’ ‘So, men of Samos’, said Aesop, ‘my client will do you no further harm; he is wealthy already. But if you put him to death, others will come along who are not rich, and their peculations will empty your treasury completely.’

Fables are suitable for addresses to popular assemblies; and they have one advantage – they are comparatively easy to invent, whereas it is hard to find parallels among actual past events. You will in fact frame them just as you frame illustrative parallels: all you require is the power of thinking out your analogy, a power developed by intellectual training. But while it is easier to supply parallels by inventing fables, it is more valuable for the political speaker to supply them by quoting what has actually happened, since in most respects the future will be like what the past has been.

Where we are unable to argue by Enthymeme, we must try to demonstrate our point by this method of Example, and to convince our hearers thereby. If we can argue by Enthymeme, we should use our Examples as subsequent supplementary evidence. They should not precede the Enthymemes: that will give the argument an inductive air, which only rarely suits the conditions of speech-making. If they follow the enthymemes, they have the effect of witnesses giving evidence, and this alway tells. For the same reason, if you put your examples first you must give a large number of them; if you put them last, a single one is sufficient; even a single witness will serve if he is a good one. It has now been stated how many varieties of argument by Example there are, and how and when they are to be employed.

21

We now turn to the use of Maxims, in order to see upon what subjects and occasions, and for what kind of speaker, they will appropriately form part of a speech. This will appear most clearly when we have defined a maxim. It is a statement; not a particular fact, such as the character of lphicrates, but of a general kind; nor is it about any and every subject – e.g. 'straight is the contrary of curved' is not a maxim – but only about questions of practical conduct, courses of conduct to be chosen or avoided. Now an Enthymeme is a syllogism dealing with such practical subjects. It is therefore roughly true that the premisses or conclusions of Enthymemes, considered apart from the rest of the argument, are Maxims: e.g.

Never should any man whose wits are sound

Have his sons taught more wisdom than their fellows.

Here we have a Maxim; add the reason or explanation, and the whole thing is an Enthymeme; thus

It makes them idle; and therewith they earn

Ill-will and jealousy throughout the city.

Again,

There is no man in all things prosperous, and

There is no man among us all is free,

are maxims; but the latter, taken with what follows it, is an Enthymeme:

For all are slaves of money or of chance.

From this definition of a maxim it follows that there are four kinds of maxims. In the first Place, the maxim may or may not have a supplement. Proof is needed where the statement is paradoxical or disputable; no supplement is wanted where the statement contains

nothing paradoxical, either because the view expressed is already a known truth, e.g.

Chiefest of blessings is health for a man, as it seemeth to me, this being the general opinion: or because, as soon as the view is stated, it is clear at a glance, e.g.

No love is true save that which loves for ever.

Of the Maxims that do have a supplement attached, some are part of an Enthymeme, e.g.

Never should any man whose wits are sound, &c. Others have the essential character of Enthymemes, but are not stated as parts of Enthymemes; these latter are reckoned the best; they are those in which the reason for the view expressed is simply implied, e.g.

O mortal man, nurse not immortal wrath.

To say 'it is not right to nurse immortal wrath' is a maxim; the added words 'mortal man' give the reason. Similarly, with the words Mortal creatures ought to cherish mortal, not immortal thoughts.

What has been said has shown us how many kinds of Maxims there are, and to what subjects the various kinds are appropriate. They must not be given without supplement if they express disputed or paradoxical views: we must, in that case, either put the supplement first and make a maxim of the conclusion, e.g. you might say, 'For my part, since both unpopularity and idleness are undesirable, I hold that it is better not to be educated'; or you may say this first, and then add the previous clause. Where a statement, without being paradoxical, is not obviously true, the reason should be added as concisely as possible. In such cases both laconic and enigmatic sayings are suitable: thus one might say what Stesichorus said to the Locrians, 'Insolence is better avoided, lest the cicalas chirp on the ground'.

The use of Maxims is appropriate only to elderly men, and in handling subjects in which the speaker is experienced. For a young man to use them is – like telling stories – unbecoming; to use them in handling things in which one has no experience is silly and ill-bred: a

fact sufficiently proved by the special fondness of country fellows for striking out maxims, and their readiness to air them.

To declare a thing to be universally true when it is not is most appropriate when working up feelings of horror and indignation in our hearers; especially by way of preface, or after the facts have been proved. Even hackneyed and commonplace maxims are to be used, if they suit one's purpose: just because they are commonplace, every one seems to agree with them, and therefore they are taken for truth. Thus, any one who is calling on his men to risk an engagement without obtaining favourable omens may quote

One omen of all is hest, that we fight for our fatherland.

Or, if he is calling on them to attack a stronger force:

The War-God showeth no favour.

Or, if he is urging people to destroy the innocent children of their enemies:

Fool, who slayeth the father and leaveth his sons to avenge him.

Some proverbs are also maxims, e.g. the proverb 'An Attic neighbour'. You are not to avoid uttering maxims that contradict such sayings as have become public property (I mean such sayings as 'know thyself' and 'nothing in excess') if doing so will raise your hearers' opinion of your character, or convey an effect of strong emotion – e.g. an angry speaker might well say, 'It is not true that we ought to know ourselves: anyhow, if this man had known himself, he would never have thought himself fit for an army command.' It will raise people's opinion of our character to say, for instance, 'We ought not to follow the saying that bids us treat our friends as future enemies: much better to treat our enemies as future friends.' The moral purpose should be implied partly by the very wording of our maxim. Failing this, we should add our reason: e.g. having said 'We should treat our friends, not as the saying advises, but as if they were going to be our friends always', we should add 'for the other behaviour is that of a traitor': or we might put it, I disapprove of that saying. A true friend

will treat his friend as if he were going to be his friend for ever'; and again, 'Nor do I approve of the saying "nothing in excess": we are bound to hate bad men excessively.' One great advantage of Maxims to a speaker is due to the want of intelligence in his hearers, who love to hear him succeed in expressing as a universal truth the opinions which they hold themselves about particular cases. I will explain what I mean by this, indicating at the same time how we are to hunt down the maxims required. The maxim, as has been already said, a general statement and people love to hear stated in general terms what they already believe in some particular connexion: e.g. if a man happens to have bad neighbours or bad children, he will agree with any one who tells him, 'Nothing is more annoying than having neighbours', or, 'Nothing is more foolish than to be the parent of children.' The orator has therefore to guess the subjects on which his hearers really hold views already, and what those views are, and then must express, as general truths, these same views on these same subjects. This is one advantage of using maxims. There is another which is more important – it invests a speech with moral character. There is moral character in every speech in which the moral purpose is conspicuous: and maxims always produce this effect, because the utterance of them amounts to a general declaration of moral principles: so that, if the maxims are sound, they display the speaker as a man of sound moral character. So much for the Maxim – its nature, varieties, proper use, and advantages.

22

We now come to the Enthymemes, and will begin the subject with some general consideration of the proper way of looking for them, and then proceed to what is a distinct question, the lines of argument to be embodied in them. It has already been pointed out that the Enthymeme is a syllogism, and in what sense it is so. We have also noted the differences between it and the syllogism of dialectic. Thus we must not carry its reasoning too far back, or the length of our argument will cause obscurity: nor must we put in all

the steps that lead to our conclusion, or we shall waste words in saying what is manifest. It is this simplicity that makes the uneducated more effective than the educated when addressing popular audiences – makes them, as the poets tell us, 'charm the crowd's ears more finely'. Educated men lay down broad general principles; uneducated men argue from common knowledge and draw obvious conclusions. We must not, therefore, start from any and every accepted opinion, but only from those we have defined – those accepted by our judges or by those whose authority they recognize: and there must, moreover, be no doubt in the minds of most, if not all, of our judges that the opinions put forward really are of this sort. We should also base our arguments upon probabilities as well as upon certainties.

The first thing we have to remember is this. Whether our argument concerns public affairs or some other subject, we must know some, if not all, of the facts about the subject on which we are to speak and argue. Otherwise we can have no materials out of which to construct arguments. I mean, for instance, how could we advise the Athenians whether they should go to war or not, if we did not know their strength, whether it was naval or military or both, and how great it is; what their revenues amount to; who their friends and enemies are; what wars, too, they have waged, and with what success; and so on? Or how could we eulogize them if we knew nothing about the sea-fight at Salamis, or the battle of Marathon, or what they did for the Heracleidae, or any other facts like that? All eulogy is based upon the noble deeds – real or imaginary – that stand to the credit of those eulogized. On the same principle, invectives are based on facts of the opposite kind: the orator looks to see what base deeds – real or imaginary – stand to the discredit of those he is attacking, such as treachery to the cause of Hellenic freedom, or the enslavement of their gallant allies against the barbarians (Aegina, Potidaea, &c.), or any other misdeeds of this kind that are recorded against them. So, too, in a court of law: whether we are prosecuting or defending, we must pay attention to the existing facts of the case. It makes no difference whether the subject is the Lacedaemonians or the Athenians, a man or a god; we must do the same thing. Suppose it to be Achilles whom we are to advise, to praise or blame, to accuse or

defend; here too we must take the facts, real or imaginary; these must be our material, whether we are to praise or blame him for the noble or base deeds he has done, to accuse or defend him for his just or unjust treatment of others, or to advise him about what is or is not to his interest. The same thing applies to any subject whatever. Thus, in handling the question whether justice is or is not a good, we must start with the real facts about justice and goodness. We see, then, that this is the only way in which any one ever proves anything, whether his arguments are strictly cogent or not: not all facts can form his basis, but only those that bear on the matter in hand: nor, plainly, can proof be effected otherwise by means of the speech. Consequently, as appears in the Topics, we must first of all have by us a selection of arguments about questions that may arise and are suitable for us to handle; and then we must try to think out arguments of the same type for special needs as they emerge; not vaguely and indefinitely, but by keeping our eyes on the actual facts of the subject we have to speak on, and gathering in as many of them as we can that bear closely upon it: for the more actual facts we have at our command, the more easily we prove our case; and the more closely they bear on the subject, the more they will seem to belong to that speech only instead of being commonplaces. By 'commonplaces' I mean, for example, eulogy of Achilles because he is a human being or a demi-god, or because he joined the expedition against Troy: these things are true of many others, so that this kind of eulogy applies no better to Achilles than to Diomede. The special facts here needed are those that are true of Achilles alone; such facts as that he slew Hector, the bravest of the Trojans, and Cycnus the invulnerable, who prevented all the Greeks from landing, and again that he was the youngest man who joined the expedition, and was not bound by oath to join it, and so on.

Here, again, we have our first principle of selection of Enthymemes – that which refers to the lines of argument selected. We will now consider the various elementary classes of enthymemes. (By an 'elementary class' of enthymeme I mean the same thing as a 'line of argument'.) We will begin, as we must begin, by observing that there are two kinds of enthymemes. One kind proves some affirmative or negative proposition; the other kind disproves one. The difference

between the two kinds is the same as that between syllogistic proof and disproof in dialectic. The demonstrative enthymeme is formed by the conjunction of compatible propositions; the refutative, by the conjunction of incompatible propositions.

We may now be said to have in our hands the lines of argument for the various special subjects that it is useful or necessary to handle, having selected the propositions suitable in various cases. We have, in fact, already ascertained the lines of argument applicable to enthymemes about good and evil, the noble and the base, justice and injustice, and also to those about types of character, emotions, and moral qualities. Let us now lay hold of certain facts about the whole subject, considered from a different and more general point of view. In the course of our discussion we will take note of the distinction between lines of proof and lines of disproof: and also of those lines of argument used in what seems to be enthymemes, but are not, since they do not represent valid syllogisms. Having made all this clear, we will proceed to classify Objections and Refutations, showing how they can be brought to bear upon enthymemes.

23

1. One line of positive proof is based upon consideration of the opposite of the thing in question. Observe whether that opposite has the opposite quality. If it has not, you refute the original proposition; if it has, you establish it. E.g. 'Temperance is beneficial; for licentiousness is hurtful'. Or, as in the Messenian speech, 'If war is the cause of our present troubles, peace is what we need to put things right again'. Or –

For if not even evil-doers should

Anger us if they meant not what they did,

Then can we owe no gratitude to such

As were constrained to do the good they did us. Or –

Since in this world liars may win belief,

Be sure of the opposite likewise – that this world

Hears many a true word and believes it not.

2. Another line of proof is got by considering some modification of the key-word, and arguing that what can or cannot be said of the one, can or cannot be said of the other: e.g. 'just' does not always mean 'beneficial', or 'justly' would always mean 'beneficially', whereas it is not desirable to be justly put to death.

3. Another line of proof is based upon correlative ideas. If it is true that one man noble or just treatment to another, you argue that the other must have received noble or just treatment; or that where it is right to command obedience, it must have been right to obey the command. Thus Diomedon, the tax-farmer, said of the taxes: 'If it is no disgrace for you to sell them, it is no disgrace for us to buy them'. Further, if 'well' or 'justly' is true of the person to whom a thing is done, you argue that it is true of the doer. But it is possible to draw a false conclusion here. It may be just that A should be treated in a certain way, and yet not just that he should be so treated by B. Hence you must ask yourself two distinct questions: (1) Is it right that A should be thus treated? (2) Is it right that B should thus treat him? and apply your results properly, according as your answers are Yes or No. Sometimes in such a case the two answers differ: you may quite easily have a position like that in the Alcmaeon of Theodectes:

And was there none to loathe thy mother's crime?

to which question Alcmaeon in reply says,

Why, there are two things to examine here.

And when Alphesiboea asks what he means, he rejoins:

They judged her fit to die, not me to slay her. Again there is the lawsuit about Demosthenes and the men who killed Nicanor; as they

were judged to have killed him justly, it was thought that he was killed justly. And in the case of the man who was killed at Thebes, the judges were requested to decide whether it was unjust that he should be killed, since if it was not, it was argued that it could not have been unjust to kill him.

4. Another line of proof is the 'a fortiori'. Thus it may be argued that if even the gods are not omniscient, certainly human beings are not. The principle here is that, if a quality does not in fact exist where it is more likely to exist, it clearly does not exist where it is less likely. Again, the argument that a man who strikes his father also strikes his neighbours follows from the principle that, if the less likely thing is true, the more likely thing is true also; for a man is less likely to strike his father than to strike his neighbours. The argument, then, may run thus. Or it may be urged that, if a thing is not true where it is more likely, it is not true where it is less likely; or that, if it is true where it is less likely, it is true where it is more likely: according as we have to show that a thing is or is not true. This argument might also be used in a case of parity, as in the lines:

Thou hast pity for thy sire, who has lost his sons:

Hast none for Oeneus, whose brave son is dead? And, again, 'if Theseus did no wrong, neither did Paris'; or 'the sons of Tyndareus did no wrong, neither did Paris'; or 'if Hector did well to slay Patroclus, Paris did well to slay Achilles'. And 'if other followers of an art are not bad men, neither are philosophers'. And 'if generals are not bad men because it often happens that they are condemned to death, neither are sophists'. And the remark that 'if each individual among you ought to think of his own city's reputation, you ought all to think of the reputation of Greece as a whole'.

5. Another line of argument is based on considerations of time. Thus Iphicrates, in the case against Harmodius, said, 'if before doing the deed I had bargained that, if I did it, I should have a statue, you would have given me one. Will you not give me one now that I have done the deed? You must not make promises when you are expecting a thing to be done for you, and refuse to fulfil them when the thing has been done.' And, again, to induce the Thebans to let Philip pass

through their territory into Attica, it was argued that 'if he had insisted on this before he helped them against the Phocians, they would have promised to do it. It is monstrous, therefore, that just because he threw away his advantage then, and trusted their honour, they should not let him pass through now'.

6. Another line is to apply to the other speaker what he has said against yourself. It is an excellent turn to give to a debate, as may be seen in the Teucer. It was employed by Iphicrates in his reply to Aristophon. 'Would you', he asked, 'take a bribe to betray the fleet?' 'No', said Aristophon; and Iphicrates replied, 'Very good: if you, who are Aristophon, would not betray the fleet, would I, who am Iphicrates?' Only, it must be recognized beforehand that the other man is more likely than you are to commit the crime in question. Otherwise you will make yourself ridiculous; it is Aristeides who is prosecuting, you cannot say that sort of thing to him. The purpose is to discredit the prosecutor, who as a rule would have it appear that his character is better than that of the defendant, a pretension which it is desirable to upset. But the use of such an argument is in all cases ridiculous if you are attacking others for what you do or would do yourself, or are urging others to do what you neither do nor would do yourself.

7. Another line of proof is secured by defining your terms. Thus, 'What is the supernatural? Surely it is either a god or the work of a god. Well, any one who believes that the work of a god exists, cannot help also believing that gods exist.' Or take the argument of Iphicrates, 'Goodness is true nobility; neither Harmodius nor Aristogeiton had any nobility before they did a noble deed'. He also argued that he himself was more akin to Harmodius and Aristogeiton than his opponent was. 'At any rate, my deeds are more akin to those of Harmodius and Aristogeiton than yours are'. Another example may be found in the Alexander. 'Every one will agree that by incontinent people we mean those who are not satisfied with the enjoyment of one love.' A further example is to be found in the reason given by Socrates for not going to the court of Archelaus. He said that 'one is insulted by being unable to requite benefits, as well as by being unable to requite injuries'. All the persons mentioned

define their term and get at its essential meaning, and then use the result when reasoning on the point at issue.

8. Another line of argument is founded upon the various senses of a word. Such a word is ‘rightly’, as has been explained in the Topics. Another line is based upon logical division. Thus, ‘All men do wrong from one of three motives, A, B, or C: in my case A and B are out of the question, and even the accusers do not allege C’.

10. Another line is based upon induction. Thus from the case of the woman of Peparethus it might be argued that women everywhere can settle correctly the facts about their children. Another example of this occurred at Athens in the case between the orator Mantias and his son, when the boy’s mother revealed the true facts: and yet another at Thebes, in the case between Ismenias and Stilbon, when Dodonis proved that it was Ismenias who was the father of her son Thettaliscus, and he was in consequence always regarded as being so. A further instance of induction may be taken from the Law of Theodectes: ‘If we do not hand over our horses to the care of men who have mishandled other people’s horses, nor ships to those who have wrecked other people’s ships, and if this is true of everything else alike, then men who have failed to secure other people’s safety are not to be employed to secure our own.’ Another instance is the argument of Alcidamas: ‘Every one honours the wise’. Thus the Parians have honoured Archilochus, in spite of his bitter tongue; the Chians Homer, though he was not their countryman; the Mytilenaeans Sappho, though she was a woman; the Lacedaemonians actually made Chilon a member of their senate, though they are the least literary of men; the Italian Greeks honoured Pythagoras; the inhabitants of Lampsacus gave public burial to Anaxagoras, though he was an alien, and honour him even to this day. (It may be argued that peoples for whom philosophers legislate are always prosperous) on the ground that the Athenians became prosperous under Solon’s laws and the Lacedaemonians under those of Lycurgus, while at Thebes no sooner did the leading men become philosophers than the country began to prosper.

11. Another line of argument is founded upon some decision already pronounced, whether on the same subject or on one like it or contrary to it. Such a proof is most effective if every one has always decided thus; but if not every one, then at any rate most people; or if all, or most, wise or good men have thus decided, or the actual judges of the present question, or those whose authority they accept, or any one whose decision they cannot gainsay because he has complete control over them, or those whom it is not seemly to gainsay, as the gods, or one's father, or one's teachers. Thus Autocles said, when attacking Mixidemides, that it was a strange thing that the Dread Goddesses could without loss of dignity submit to the judgement of the Areopagus, and yet Mixidemides could not. Or as Sappho said, 'Death is an evil thing; the gods have so judged it, or they would die'. Or again as Aristippus said in reply to Plato when he spoke somewhat too dogmatically, as Aristippus thought: 'Well, anyhow, our friend', meaning Socrates, 'never spoke like that'. And Hegesippus, having previously consulted Zeus at Olympia, asked Apollo at Delphi 'whether his opinion was the same as his father's', implying that it would be shameful for him to contradict his father. Thus too Isocrates argued that Helen must have been a good woman, because Theseus decided that she was; and Paris a good man, because the goddesses chose him before all others; and Evagoras also, says Isocrates, was good, since when Conon met with his misfortune he betook himself to Evagoras without trying any one else on the way.

12. Another line of argument consists in taking separately the parts of a subject. Such is that given in the Topics: 'What sort of motion is the soul? for it must be this or that.' The Socrates of Theodectes provides an example: 'What temple has he profaned? What gods recognized by the state has he not honoured?'

13. Since it happens that any given thing usually has both good and bad consequences, another line of argument consists in using those consequences as a reason for urging that a thing should or should not be done, for prosecuting or defending any one, for eulogy or censure. E.g. education leads both to unpopularity, which is bad, and to wisdom, which is good. Hence you either argue, 'It is therefore not well to be educated, since it is not well to be unpopular': or you

answer, 'No, it is well to be educated, since it is well to be wise'. The Art of Rhetoric of Callippus is made up of this line of argument, with the addition of those of Possibility and the others of that kind already described.

14. Another line of argument is used when we have to urge or discourage a course of action that may be done in either of two opposite ways, and have to apply the method just mentioned to both. The difference between this one and the last is that, whereas in the last any two things are contrasted, here the things contrasted are opposites. For instance, the priestess enjoined upon her son not to take to public speaking: 'For', she said, 'if you say what is right, men will hate you; if you say what is wrong, the gods will hate you.' The reply might be, 'On the contrary, you ought to take to public speaking: for if you say what is right the gods will love you; if you say what is wrong, men will love you.' This amounts to the proverbial 'buying the marsh with the salt'. It is just this situation, viz. when each of two opposites has both a good and a bad consequence opposite respectively to each other, that has been termed divarication.

15. Another line of argument is this: The things people approve of openly are not those which they approve of secretly: openly, their chief praise is given to justice and nobleness; but in their hearts they prefer their own advantage. Try, in face of this, to establish the point of view which your opponent has not adopted. This is the most effective of the forms of argument that contradict common opinion.

16. Another line is that of rational correspondence. E.g. Iphicrates, when they were trying to compel his son, a youth under the prescribed age, to perform one of the state duties because he was tall, said 'If you count tall boys men, you will next be voting short men boys'. And Theodectes in his Law said, 'You make citizens of such mercenaries as Strabax and Charidemus, as a reward of their merits; will you not make exiles of such citizens as those who have done irreparable harm among the mercenaries?'

17. Another line is the argument that if two results are the same their antecedents are also the same. For instance, it was a saying of Xenophanes that to assert that the gods had birth is as impious as to

say that they die; the consequence of both statements is that there is a time when the gods do not exist. This line of proof assumes generally that the result of any given thing is always the same: e.g. 'you are going to decide not about Isocrates, but about the value of the whole profession of philosophy.' Or, 'to give earth and water' means slavery; or, 'to share in the Common Peace' means obeying orders. We are to make either such assumptions or their opposite, as suits us best.

18. Another line of argument is based on the fact that men do not always make the same choice on a later as on an earlier occasion, but reverse their previous choice. E.g. the following enthymeme: 'When we were exiles, we fought in order to return; now we have returned, it would be strange to choose exile in order not to have to fight.' one occasion, that is, they chose to be true to their homes at the cost of fighting, and on the other to avoid fighting at the cost of deserting their homes.

19. Another line of argument is the assertion that some possible motive for an event or state of things is the real one: e.g. that a gift was given in order to cause pain by its withdrawal. This notion underlies the lines:

God gives to many great prosperity,

Not of good God towards them, but to make

The ruin of them more conspicuous. Or take the passage from the Meleager of Antiphon:

To slay no boar, but to be witnesses

Of Meleager's prowess unto Greece. Or the argument in the Ajax of Theodectes, that Diomede chose out Odysseus not to do him honour, but in order that his companion might be a lesser man than himself – such a motive for doing so is quite possible.

20. Another line of argument is common to forensic and deliberative oratory, namely, to consider inducements and deterrents, and the motives people have for doing or avoiding the actions in question.

These are the conditions which make us bound to act if they are for us, and to refrain from action if they are against us: that is, we are bound to act if the action is possible, easy, and useful to ourselves or our friends or hurtful to our enemies; this is true even if the action entails loss, provided the loss is outweighed by the solid advantage. A speaker will urge action by pointing to such conditions, and discourage it by pointing to the opposite. These same arguments also form the materials for accusation or defence – the deterrents being pointed out by the defence, and the inducements by the prosecution. As for the defence,...This topic forms the whole Art of Rhetoric both of Pamphilus and of Callippus.

21. Another line of argument refers to things which are supposed to happen and yet seem incredible. We may argue that people could not have believed them, if they had not been true or nearly true: even that they are the more likely to be true because they are incredible. For the things which men believe are either facts or probabilities: if, therefore, a thing that is believed is improbable and even incredible, it must be true, since it is certainly not believed because it is at all probable or credible. An example is what Androcles of the deme Pitthus said in his well-known arraignment of the law. The audience tried to shout him down when he observed that the laws required a law to set them right. 'Why', he went on, 'fish need salt, improbable and incredible as this might seem for creatures reared in salt water; and olive-cakes need oil, incredible as it is that what produces oil should need it.'

22. Another line of argument is to refute our opponent's case by noting any contrasts or contradictions of dates, acts, or words that it anywhere displays; and this in any of the three following connexions. (1) Referring to our opponent's conduct, e.g. 'He says he is devoted to you, yet he conspired with the Thirty.' (2) Referring to our own conduct, e.g. 'He says I am litigious, and yet he cannot prove that I have been engaged in a single lawsuit.' (3) Referring to both of us together, e.g. 'He has never even lent any one a penny, but I have ransomed quite a number of you.'

23. Another line that is useful for men and causes that have been really or seemingly slandered, is to show why the facts are not as supposed; pointing out that there is a reason for the false impression given. Thus a woman, who had palmed off her son on another woman, was thought to be the lad's mistress because she embraced him; but when her action was explained the charge was shown to be groundless. Another example is from the Ajax of Theodectes, where Odysseus tells Ajax the reason why, though he is really braver than Ajax, he is not thought so.

24. Another line of argument is to show that if the cause is present, the effect is present, and if absent, absent. For by proving the cause you at once prove the effect, and conversely nothing can exist without its cause. Thus Thrasybulus accused Leodamas of having had his name recorded as a criminal on the slab in the Acropolis, and of erasing the record in the time of the Thirty Tyrants: to which Leodamas replied, 'Impossible: for the Thirty would have trusted me all the more if my quarrel with the commons had been inscribed on the slab.'

25. Another line is to consider whether the accused person can take or could have taken a better course than that which he is recommending or taking, or has taken. If he has not taken this better course, it is clear that he is not guilty, since no one deliberately and consciously chooses what is bad. This argument is, however, fallacious, for it often becomes clear after the event how the action could have been done better, though before the event this was far from clear.

26. Another line is, when a contemplated action is inconsistent with any past action, to examine them both together. Thus, when the people of Elea asked Xenophanes if they should or should not sacrifice to Leucothea and mourn for her, he advised them not to mourn for her if they thought her a goddess, and not to sacrifice to her if they thought her a mortal woman.

27. Another line is to make previous mistakes the grounds of accusation or defence. Thus, in the Medea of Carcinus the accusers allege that Medea has slain her children; 'at all events', they say, 'they

are not to be seen' – Medea having made the mistake of sending her children away. In defence she argues that it is not her children, but Jason, whom she would have slain; for it would have been a mistake on her part not to do this if she had done the other. This special line of argument for enthymeme forms the whole of the Art of Rhetoric in use before Theodorus.

Another line is to draw meanings from names. Sophocles, for instance, says,

O steel in heart as thou art steel in name. This line of argument is common in praises of the gods. Thus, too, Conon called Thrasybulus rash in counsel. And Herodicus said of Thrasymachus, 'You are always bold in battle'; of Polus, 'you are always a colt'; and of the legislator Draco that his laws were those not of a human being but of a dragon, so savage were they. And, in Euripides, Hecuba says of Aphrodite,

Her name and Folly's (aphrosuns) lightly begin alike, and Chaeremon writes

Pentheus – a name foreshadowing grief (penthos) to come.

The Refutative Enthymeme has a greater reputation than the Demonstrative, because within a small space it works out two opposing arguments, and arguments put side by side are clearer to the audience. But of all syllogisms, whether refutative or demonstrative, those are most applauded of which we foresee the conclusions from the beginning, so long as they are not obvious at first sight – for part of the pleasure we feel is at our own intelligent anticipation; or those which we follow well enough to see the point of them as soon as the last word has been uttered.

24

Besides genuine syllogisms, there may be syllogisms that look genuine but are not; and since an enthymeme is merely a syllogism of a particular kind, it follows that, besides genuine enthymemes, there may be those that look genuine but are not.

1. Among the lines of argument that form the Spurious Enthymeme the first is that which arises from the particular words employed.

(a) One variety of this is when – as in dialectic, without having gone through any reasoning process, we make a final statement as if it were the conclusion of such a process, 'Therefore so-and-so is not true', 'Therefore also so-and-so must be true' – so too in rhetoric a compact and antithetical utterance passes for an enthymeme, such language being the proper province of enthymeme, so that it is seemingly the form of wording here that causes the illusion mentioned. In order to produce the effect of genuine reasoning by our form of wording it is useful to summarize the results of a number of previous reasonings: as 'some he saved – others he avenged – the Greeks he freed'. Each of these statements has been previously proved from other facts; but the mere collocation of them gives the impression of establishing some fresh conclusion.

(b) Another variety is based on the use of similar words for different things; e.g. the argument that the mouse must be a noble creature, since it gives its name to the most august of all religious rites – for such the Mysteries are. Or one may introduce, into a eulogy of the dog, the dog-star; or Pan, because Pindar said:

O thou blessed one!

Thou whom they of Olympus call

The hound of manifold shape

That follows the Mother of Heaven: or we may argue that, because there is much disgrace in there not being a dog about, there is honour in being a dog. Or that Hermes is readier than any other god to go shares, since we never say 'shares all round' except of him. Or that

speech is a very excellent thing, since good men are not said to be worth money but to be worthy of esteem – the phrase 'worthy of esteem' also having the meaning of 'worth speech'.

2. Another line is to assert of the whole what is true of the parts, or of the parts what is true of the whole. A whole and its parts are supposed to be identical, though often they are not. You have therefore to adopt whichever of these two lines better suits your purpose. That is how Euthydemus argues: e.g. that any one knows that there is a trireme in the Peiraeus, since he knows the separate details that make up this statement. There is also the argument that one who knows the letters knows the whole word, since the word is the same thing as the letters which compose it; or that, if a double portion of a certain thing is harmful to health, then a single portion must not be called wholesome, since it is absurd that two good things should make one bad thing. Put thus, the enthymeme is refutative; put as follows; demonstrative: 'For one good thing cannot be made up of two bad things.' The whole line of argument is fallacious. Again, there is Polycrates' saying that Thrasybulus put down thirty tyrants, where the speaker adds them up one by one. Or the argument in the Orestes of Theodectes, where the argument is from part to whole:

'Tis right that she who slays her lord should die. 'It is right, too, that the son should avenge his father. Very good: these two things are what Orestes has done.' Still, perhaps the two things, once they are put together, do not form a right act. The fallacy might also be said to be due to omission, since the speaker fails to say by whose hand a husband-slayer should die.

3. Another line is the use of indignant language, whether to support your own case or to overthrow your opponent's. We do this when we paint a highly-coloured picture of the situation without having proved the facts of it: if the defendant does so, he produces an impression of his innocence; and if the prosecutor goes into a passion, he produces an impression of the defendant's guilt. Here there is no genuine enthymeme: the hearer infers guilt or innocence, but no proof is given, and the inference is fallacious accordingly.

4. Another line is to use a ‘Sign’, or single instance, as certain evidence; which, again, yields no valid proof. Thus, it might be said that lovers are useful to their countries, since the love of Harmodius and Aristogeiton caused the downfall of the tyrant Hipparchus. Or, again, that Dionysius is a thief, since he is a vicious man – there is, of course, no valid proof here; not every vicious man is a thief, though every thief is a vicious man.

5. Another line represents the accidental as essential. An instance is what Polycrates says of the mice, that they ‘came to the rescue’ because they gnawed through the bowstrings. Or it might be maintained that an invitation to dinner is a great honour, for it was because he was not invited that Achilles was ‘angered’ with the Greeks at Tenedos? As a fact, what angered him was the insult involved; it was a mere accident that this was the particular form that the insult took.

6. Another is the argument from consequence. In the Alexander, for instance, it is argued that Paris must have had a lofty disposition, since he despised society and lived by himself on Mount Ida: because lofty people do this kind of thing, therefore Paris too, we are to suppose, had a lofty soul. Or, if a man dresses fashionably and roams around at night, he is a rake, since that is the way rakes behave. Another similar argument points out that beggars sing and dance in temples, and that exiles can live wherever they please, and that such privileges are at the disposal of those we account happy and therefore every one might be regarded as happy if only he has those privileges. What matters, however, is the circumstances under which the privileges are enjoyed. Hence this line too falls under the head of fallacies by omission.

7. Another line consists in representing as causes things which are not causes, on the ground that they happened along with or before the event in question. They assume that, because B happens after A, it happens because of A. Politicians are especially fond of taking this line. Thus Demades said that the policy of Demosthenes was the cause of all the mischief, ‘for after it the war occurred’.

8. Another line consists in leaving out any mention of time and circumstances. E.g. the argument that Paris was justified in taking Helen, since her father left her free to choose: here the freedom was presumably not perpetual; it could only refer to her first choice, beyond which her father's authority could not go. Or again, one might say that to strike a free man is an act of wanton outrage; but it is not so in every case – only when it is unprovoked.

9. Again, a spurious syllogism may, as in 'eristical' discussions, be based on the confusion of the absolute with that which is not absolute but particular. As, in dialectic, for instance, it may be argued that what-is-not is, on the ground that what-is-not is what-is-not: or that the unknown can be known, on the ground that it can be known to he unknown: so also in rhetoric a spurious enthymeme may be based on the confusion of some particular probability with absolute probability. Now no particular probability is universally probable: as Agathon says,

One might perchance say that was probable –

That things improbable oft will hap to men.

For what is improbable does happen, and therefore it is probable that improbable things will happen. Granted this, one might argue that 'what is improbable is probable'. But this is not true absolutely. As, in eristic, the imposture comes from not adding any clause specifying relationship or reference or manner; so here it arises because the probability in question is not general but specific. It is of this line of argument that Corax's Art of Rhetoric is composed. If the accused is not open to the charge – for instance if a weakling be tried for violent assault – the defence is that he was not likely to do such a thing. But if he is open to the charge – i.e. if he is a strong man – the defence is still that he was not likely to do such a thing, since he could be sure that people would think he was likely to do it. And so with any other charge: the accused must be either open or not open to it: there is in either case an appearance of probable innocence, but whereas in the latter case the probability is genuine, in the former it can only be asserted in the special sense mentioned. This sort of argument illustrates what is meant by making the worse argument seem the

better. Hence people were right in objecting to the training Protagoras undertook to give them. It was a fraud; the probability it handled was not genuine but spurious, and has a place in no art except Rhetoric and Eristic.

25

Enthymemes, genuine and apparent, have now been described; the next subject is their Refutation.

An argument may be refuted either by a counter-syllogism or by bringing an objection. It is clear that counter-syllogisms can be built up from the same lines of arguments as the original syllogisms: for the materials of syllogisms are the ordinary opinions of men, and such opinions often contradict each other. Objections, as appears in the Topics, may be raised in four ways – either by directly attacking your opponent's own statement, or by putting forward another statement like it, or by putting forward a statement contrary to it, or by quoting previous decisions.

1. By 'attacking your opponent's own statement' I mean, for instance, this: if his enthymeme should assert that love is always good, the objection can be brought in two ways, either by making the general statement that 'all want is an evil', or by making the particular one that there would be no talk of 'Caunian love' if there were not evil loves as well as good ones.

2. An objection 'from a contrary statement' is raised when, for instance, the opponent's enthymeme having concluded that a good man does good to all his friends, you object, 'That proves nothing, for a bad man does not do evil to all his friends'.

3. An example of an objection 'from a like statement' is, the enthymeme having shown that ill-used men always hate their ill-users, to reply, 'That proves nothing, for well-used men do not always love those who used them well'.

4. The ‘decisions’ mentioned are those proceeding from well-known men; for instance, if the enthymeme employed has concluded that ‘that allowance ought to be made for drunken offenders, since they did not know what they were doing’, the objection will be, ‘Pittacus, then, deserves no approval, or he would not have prescribed specially severe penalties for offences due to drunkenness’.

Enthymemes are based upon one or other of four kinds of alleged fact: (1) Probabilities, (2) Examples, (3) Infallible Signs, (4) Ordinary Signs. (1) Enthymemes based upon Probabilities are those which argue from what is, or is supposed to be, usually true. (2) Enthymemes based upon Example are those which proceed by induction from one or more similar cases, arrive at a general proposition, and then argue deductively to a particular inference. (3) Enthymemes based upon Infallible Signs are those which argue from the inevitable and invariable. (4) Enthymemes based upon ordinary Signs are those which argue from some universal or particular proposition, true or false.

Now (1) as a Probability is that which happens usually but not always, Enthymemes founded upon Probabilities can, it is clear, always be refuted by raising some objection. The refutation is not always genuine: it may be spurious: for it consists in showing not that your opponent’s premiss is not probable, but Only in showing that it is not inevitably true. Hence it is always in defence rather than in accusation that it is possible to gain an advantage by using this fallacy. For the accuser uses probabilities to prove his case: and to refute a conclusion as improbable is not the same thing as to refute it as not inevitable. Any argument based upon what usually happens is always open to objection: otherwise it would not be a probability but an invariable and necessary truth. But the judges think, if the refutation takes this form, either that the accuser’s case is not probable or that they must not decide it; which, as we said, is a false piece of reasoning. For they ought to decide by considering not merely what must be true but also what is likely to be true: this is, indeed, the meaning of ‘giving a verdict in accordance with one’s honest opinion’. Therefore it is not enough for the defendant to refute the accusation by proving that the charge is not hound to be

true: he must do so by showing that it is not likely to be true. For this purpose his objection must state what is more usually true than the statement attacked. It may do so in either of two ways: either in respect of frequency or in respect of exactness. It will be most convincing if it does so in both respects; for if the thing in question both happens oftener as we represent it and happens more as we represent it, the probability is particularly great.

(2) Fallible Signs, and Enthymemes based upon them, can be refuted even if the facts are correct, as was said at the outset. For we have shown in the Analytics that no Fallible Sign can form part of a valid logical proof.

(3) Enthymemes depending on examples may be refuted in the same way as probabilities. If we have a negative instance, the argument is refuted, in so far as it is proved not inevitable, even though the positive examples are more similar and more frequent. And if the positive examples are more numerous and more frequent, we must contend that the present case is dissimilar, or that its conditions are dissimilar, or that it is different in some way or other.

(4) It will be impossible to refute Infallible Signs, and Enthymemes resting on them, by showing in any way that they do not form a valid logical proof: this, too, we see from the Analytics. All we can do is to show that the fact alleged does not exist. If there is no doubt that it does, and that it is an Infallible Sign, refutation now becomes impossible: for this is equivalent to a demonstration which is clear in every respect.

26

Amplification and Depreciation are not an element of enthymeme. By ‘an element of enthymeme’ I mean the same thing as a line of enthymematic argument – a general class embracing a large number of particular kinds of enthymeme. Amplification and Depreciation

are one kind of enthymeme, viz. the kind used to show that a thing is great or small; just as there are other kinds used to show that a thing is good or bad, just or unjust, and anything else of the sort. All these things are the subject-matter of syllogisms and enthymemes; none of these is the line of argument of an enthymeme; no more, therefore, are Amplification and Depreciation. Nor are Refutative Enthymemes a different species from Constructive. For it is clear that refutation consists either in offering positive proof or in raising an objection. In the first case we prove the opposite of our adversary's statements. Thus, if he shows that a thing has happened, we show that it has not; if he shows that it has not happened, we show that it has. This, then, could not be the distinction if there were one, since the same means are employed by both parties, enthymemes being adduced to show that the fact is or is not so-and-so. An objection, on the other hand, is not an enthymeme at all, as was said in the Topics, consists in stating some accepted opinion from which it will be clear that our opponent has not reasoned correctly or has made a false assumption.

Three points must be studied in making a speech; and we have now completed the account of (1) Examples, Maxims, Enthymemes, and in general the thought-element the way to invent and refute arguments. We have next to discuss (2) Style, and (3) Arrangement.

Book III

1

In making a speech one must study three points: first, the means of producing persuasion; second, the style, or language, to be used; third, the proper arrangement of the various parts of the speech. We

have already specified the sources of persuasion. We have shown that these are three in number; what they are; and why there are only these three: for we have shown that persuasion must in every case be effected either (1) by working on the emotions of the judges themselves, (2) by giving them the right impression of the speakers' character, or (3) by proving the truth of the statements made.

Enthymemes also have been described, and the sources from which they should be derived; there being both special and general lines of argument for enthymemes.

Our next subject will be the style of expression. For it is not enough to know what we ought to say; we must also say it as we ought; much help is thus afforded towards producing the right impression of a speech. The first question to receive attention was naturally the one that comes first naturally – how persuasion can be produced from the facts themselves. The second is how to set these facts out in language. A third would be the proper method of delivery; this is a thing that affects the success of a speech greatly; but hitherto the subject has been neglected. Indeed, it was long before it found a way into the arts of tragic drama and epic recitation: at first poets acted their tragedies themselves. It is plain that delivery has just as much to do with oratory as with poetry. (In connexion with poetry, it has been studied by Glaucon of Teos among others.) It is, essentially, a matter of the right management of the voice to express the various emotions – of speaking loudly, softly, or between the two; of high, low, or intermediate pitch; of the various rhythms that suit various subjects. These are the three things – volume of sound, modulation of pitch, and rhythm – that a speaker bears in mind. It is those who do bear them in mind who usually win prizes in the dramatic contests; and just as in drama the actors now count for more than the poets, so it is in the contests of public life, owing to the defects of our political institutions. No systematic treatise upon the rules of delivery has yet been composed; indeed, even the study of language made no progress till late in the day. Besides, delivery is – very properly – not regarded as an elevated subject of inquiry. Still, the whole business of rhetoric being concerned with appearances, we must pay attention to the subject of delivery, unworthy though it is,

because we cannot do without it. The right thing in speaking really is that we should be satisfied not to annoy our hearers, without trying to delight them: we ought in fairness to fight our case with no help beyond the bare facts: nothing, therefore, should matter except the proof of those facts. Still, as has been already said, other things affect the result considerably, owing to the defects of our hearers. The arts of language cannot help having a small but real importance, whatever it is we have to expound to others: the way in which a thing is said does affect its intelligibility. Not, however, so much importance as people think. All such arts are fanciful and meant to charm the hearer. Nobody uses fine language when teaching geometry.

When the principles of delivery have been worked out, they will produce the same effect as on the stage. But only very slight attempts to deal with them have been made and by a few people, as by Thrasymachus in his 'Appeals to Pity'. Dramatic ability is a natural gift, and can hardly be systematically taught. The principles of good diction can be so taught, and therefore we have men of ability in this direction too, who win prizes in their turn, as well as those speakers who excel in delivery – speeches of the written or literary kind owe more of their effect to their direction than to their thought.

It was naturally the poets who first set the movement going; for words represent things, and they had also the human voice at their disposal, which of all our organs can best represent other things. Thus the arts of recitation and acting were formed, and others as well. Now it was because poets seemed to win fame through their fine language when their thoughts were simple enough, that the language of oratorical prose at first took a poetical colour, e.g. that of Gorgias. Even now most uneducated people think that poetical language makes the finest discourses. That is not true: the language of prose is distinct from that of poetry. This is shown by the state of things to-day, when even the language of tragedy has altered its character. Just as iambics were adopted, instead of tetrameters, because they are the most prose-like of all metres, so tragedy has given up all those words, not used in ordinary talk, which decorated the early drama and are still used by the writers of hexameter poems.

It is therefore ridiculous to imitate a poetical manner which the poets themselves have dropped; and it is now plain that we have not to treat in detail the whole question of style, but may confine ourselves to that part of it which concerns our present subject, rhetoric. The other – the poetical – part of it has been discussed in the treatise on the Art of Poetry.

2

We may, then, start from the observations there made, including the definition of style. Style to be good must be clear, as is proved by the fact that speech which fails to convey a plain meaning will fail to do just what speech has to do. It must also be appropriate, avoiding both meanness and undue elevation; poetical language is certainly free from meanness, but it is not appropriate to prose. Clearness is secured by using the words (nouns and verbs alike) that are current and ordinary. Freedom from meanness, and positive adornment too, are secured by using the other words mentioned in the Art of Poetry. Such variation from what is usual makes the language appear more stately. People do not feel towards strangers as they do towards their own countrymen, and the same thing is true of their feeling for language. It is therefore well to give to everyday speech an unfamiliar air: people like what strikes them, and are struck by what is out of the way. In verse such effects are common, and there they are fitting: the persons and things there spoken of are comparatively remote from ordinary life. In prose passages they are far less often fitting because the subject-matter is less exalted. Even in poetry, it is not quite appropriate that fine language should be used by a slave or a very young man, or about very trivial subjects: even in poetry the style, to be appropriate, must sometimes be toned down, though at other times heightened. We can now see that a writer must disguise his art and give the impression of speaking naturally and not artificially. Naturalness is persuasive, artificiality is the contrary; for our hearers are prejudiced and think we have some design against them, as if we were mixing their wines for them. It is like the

difference between the quality of Theodorus' voice and the voices of all other actors: his really seems to be that of the character who is speaking, theirs do not. We can hide our purpose successfully by taking the single words of our composition from the speech of ordinary life. This is done in poetry by Euripides, who was the first to show the way to his successors.

Language is composed of nouns and verbs. Nouns are of the various kinds considered in the treatise on Poetry. Strange words, compound words, and invented words must be used sparingly and on few occasions: on what occasions we shall state later. The reason for this restriction has been already indicated: they depart from what is suitable, in the direction of excess. In the language of prose, besides the regular and proper terms for things, metaphorical terms only can be used with advantage. This we gather from the fact that these two classes of terms, the proper or regular and the metaphorical – these and no others – are used by everybody in conversation. We can now see that a good writer can produce a style that is distinguished without being obtrusive, and is at the same time clear, thus satisfying our definition of good oratorical prose. Words of ambiguous meaning are chiefly useful to enable the sophist to mislead his hearers. Synonyms are useful to the poet, by which I mean words whose ordinary meaning is the same, e.g. 'porheueseai' (advancing) and 'badizein' (proceeding); these two are ordinary words and have the same meaning.

In the Art of Poetry, as we have already said, will be found definitions of these kinds of words; a classification of Metaphors; and mention of the fact that metaphor is of great value both in poetry and in prose. Prose-writers must, however, pay specially careful attention to metaphor, because their other resources are scantier than those of poets. Metaphor, moreover, gives style clearness, charm, and distinction as nothing else can: and it is not a thing whose use can be taught by one man to another. Metaphors, like epithets, must be fitting, which means that they must fairly correspond to the thing signified: failing this, their inappropriateness will be conspicuous: the want of harmony between two things is emphasized by their being placed side by side. It is like having to ask ourselves what dress will

suit an old man; certainly not the crimson cloak that suits a young man. And if you wish to pay a compliment, you must take your metaphor from something better in the same line; if to disparage, from something worse. To illustrate my meaning: since opposites are in the same class, you do what I have suggested if you say that a man who begs 'prays', and a man who prays 'begs'; for praying and begging are both varieties of asking. So Iphicrates called Callias a 'mendicant priest' instead of a 'torch-bearer', and Callias replied that Iphicrates must be uninitiated or he would have called him not a 'mendicant priest' but a 'torch-bearer'. Both are religious titles, but one is honourable and the other is not. Again, somebody calls actors 'hangers-on of Dionysus', but they call themselves 'artists': each of these terms is a metaphor, the one intended to throw dirt at the actor, the other to dignify him. And pirates now call themselves 'purveyors'. We can thus call a crime a mistake, or a mistake a crime. We can say that a thief 'took' a thing, or that he 'plundered' his victim. An expression like that of Euripides' Telephus,

King of the oar, on Mysia's coast he landed, is inappropriate; the word 'king' goes beyond the dignity of the subject, and so the art is not concealed. A metaphor may be amiss because the very syllables of the words conveying it fail to indicate sweetness of vocal utterance. Thus Dionysius the Brazen in his elegies calls poetry 'Calliope's screech'. Poetry and screeching are both, to be sure, vocal utterances. But the metaphor is bad, because the sounds of 'screeching', unlike those of poetry, are discordant and unmeaning. Further, in using metaphors to give names to nameless things, we must draw them not from remote but from kindred and similar things, so that the kinship is clearly perceived as soon as the words are said. Thus in the celebrated riddle

I marked how a man glued bronze with fire to another man's body,

the process is nameless; but both it and gluing are a kind of application, and that is why the application of the cupping-glass is here called a 'gluing'. Good riddles do, in general, provide us with satisfactory metaphors: for metaphors imply riddles, and therefore a good riddle can furnish a good metaphor. Further, the materials of

metaphors must be beautiful; and the beauty, like the ugliness, of all words may, as Licymnius says, lie in their sound or in their meaning. Further, there is a third consideration – one that upsets the fallacious argument of the sophist Bryson, that there is no such thing as foul language, because in whatever words you put a given thing your meaning is the same. This is untrue. One term may describe a thing more truly than another, may be more like it, and set it more intimately before our eyes. Besides, two different words will represent a thing in two different lights; so on this ground also one term must be held fairer or fouler than another. For both of two terms will indicate what is fair, or what is foul, but not simply their fairness or their foulness, or if so, at any rate not in an equal degree. The materials of metaphor must be beautiful to the ear, to the understanding, to the eye or some other physical sense. It is better, for instance, to say 'rosy-fingered morn', than 'crimson-fingered' or, worse still, 'red-fingered morn'. The epithets that we apply, too, may have a bad and ugly aspect, as when Orestes is called a 'mother-slayer'; or a better one, as when he is called his 'father's avenger'. Simonides, when the victor in the mule-race offered him a small fee, refused to write him an ode, because, he said, it was so unpleasant to write odes to half-asses: but on receiving an adequate fee, he wrote

Hail to you, daughters of storm-footed steeds? though of course they were daughters of asses too. The same effect is attained by the use of diminutives, which make a bad thing less bad and a good thing less good. Take, for instance, the banter of Aristophanes in the Babylonians where he uses 'goldlet' for 'gold', 'cloaklet' for 'cloak', 'scoffiet' for 'scoff, and 'plaguelet'. But alike in using epithets and in using diminutives we must be wary and must observe the mean.

3

Bad taste in language may take any of four forms:

(1) The misuse of compound words. Lycophron, for instance, talks of the 'many visaged heaven' above the 'giant-crested earth', and again the 'strait-pathed shore'; and Gorgias of the 'pauper-poet flatterer' and 'oath-breaking and over-oath-keeping'. Alcidamas uses such expressions as 'the soul filling with rage and face becoming flame-flushed', and 'he thought their enthusiasm would be issue-fraught' and 'issue-fraught he made the persuasion of his words', and 'sombre-hued is the floor of the sea'.The way all these words are compounded makes them, we feel, fit for verse only. This, then, is one form in which bad taste is shown.

(2) Another is the employment of strange words. For instance, Lycophron talks of 'the prodigious Xerxes' and 'spoliative Sciron'; Alcidamas of 'a toy for poetry' and 'the witlessness of nature', and says 'whetted with the unmitigated temper of his spirit'.

(3) A third form is the use of long, unseasonable, or frequent epithets. It is appropriate enough for a poet to talk of 'white milk', in prose such epithets are sometimes lacking in appropriateness or, when spread too thickly, plainly reveal the author turning his prose into poetry. Of course we must use some epithets, since they lift our style above the usual level and give it an air of distinction. But we must aim at the due mean, or the result will be worse than if we took no trouble at all; we shall get something actually bad instead of something merely not good. That is why the epithets of Alcidamas seem so tasteless; he does not use them as the seasoning of the meat, but as the meat itself, so numerous and swollen and aggressive are they. For instance, he does not say 'sweat', but 'the moist sweat'; not 'to the Isthmian games', but 'to the world-concourse of the Isthmian games'; not 'laws', but 'the laws that are monarchs of states'; not 'at a run', but 'his heart impelling him to speed of foot'; not 'a school of the Muses', but 'Nature's school of the Muses had he inherited'; and so 'frowning care of heart', and 'achiever' not of 'popularity' but of 'universal popularity', and 'dispenser of pleasure to his audience', and 'he concealed it' not 'with boughs' but 'with boughs of the forest trees', and 'he clothed' not 'his body' but 'his body's nakedness', and 'his soul's desire was counter imitative' (this's at one and the same time a compound and an epithet, so that it

seems a poet's effort), and 'so extravagant the excess of his wickedness'. We thus see how the inappropriateness of such poetical language imports absurdity and tastelessness into speeches, as well as the obscurity that comes from all this verbosity – for when the sense is plain, you only obscure and spoil its clearness by piling up words.

The ordinary use of compound words is where there is no term for a thing and some compound can be easily formed, like 'pastime' (chronotribein); but if this is much done, the prose character disappears entirely. We now see why the language of compounds is just the thing for writers of dithyrambs, who love sonorous noises; strange words for writers of epic poetry, which is a proud and stately affair; and metaphor for iambic verse, the metre which (as has been already' said) is widely used to-day.

(4) There remains the fourth region in which bad taste may be shown, metaphor. Metaphors like other things may be inappropriate. Some are so because they are ridiculous; they are indeed used by comic as well as tragic poets. Others are too grand and theatrical; and these, if they are far-fetched, may also be obscure. For instance, Gorgias talks of 'events that are green and full of sap', and says 'foul was the deed you sowed and evil the harvest you reaped'. That is too much like poetry. Alcidamas, again, called philosophy 'a fortress that threatens the power of law', and the Odyssey 'a goodly looking-glass of human life',' talked about 'offering no such toy to poetry': all these expressions fail, for the reasons given, to carry the hearer with them. The address of Gorgias to the swallow, when she had let her droppings fall on him as she flew overhead, is in the best tragic manner. He said, 'Nay, shame, O Philomela'. Considering her as a bird, you could not call her act shameful; considering her as a girl, you could; and so it was a good gibe to address her as what she was once and not as what she is.

4

The Simile also is a metaphor; the difference is but slight. When the poet says of Achilles that he

Leapt on the foe as a lion, this is a simile; when he says of him 'the lion leapt', it is a metaphor – here, since both are courageous, he has transferred to Achilles the name of 'lion'. Similes are useful in prose as well as in verse; but not often, since they are of the nature of poetry. They are to be employed just as metaphors are employed, since they are really the same thing except for the difference mentioned.

The following are examples of similes. Androtion said of Idrieus that he was like a terrier let off the chain, that flies at you and bites you – Idrieus too was savage now that he was let out of his chains. Theodamas compared Archidamus to an Euxenus who could not do geometry – a proportional simile, implying that Euxenus is an Archidamus who can do geometry. In Plato's Republic those who strip the dead are compared to curs which bite the stones thrown at them but do not touch the thrower, and there is the simile about the Athenian people, who are compared to a ship's captain who is strong but a little deaf; and the one about poets' verses, which are likened to persons who lack beauty but possess youthful freshness – when the freshness has faded the charm perishes, and so with verses when broken up into prose. Pericles compared the Samians to children who take their pap but go on crying; and the Boeotians to holm-oaks, because they were ruining one another by civil wars just as one oak causes another oak's fall. Demosthenes said that the Athenian people were like sea-sick men on board ship. Again, Demosthenes compared the political orators to nurses who swallow the bit of food themselves and then smear the children's lips with the spittle. Antisthenes compared the lean Cephisodotus to frankincense, because it was his consumption that gave one pleasure. All these ideas may be expressed either as similes or as metaphors; those which succeed as metaphors will obviously do well also as similes, and similes, with the explanation omitted, will appear as metaphors. But the proportional metaphor must always apply reciprocally to either of its

co-ordinate terms. For instance, if a drinking-bowl is the shield of Dionysus, a shield may fittingly be called the drinking-bowl of Ares.

5

Such, then, are the ingredients of which speech is composed. The foundation of good style is correctness of language, which falls under five heads. (1) First, the proper use of connecting words, and the arrangement of them in the natural sequence which some of them require. For instance, the connective 'men' (e.g. ego men) requires the correlative de (e.g. o de). The answering word must be brought in before the first has been forgotten, and not be widely separated from it; nor, except in the few cases where this is appropriate, is another connective to be introduced before the one required. Consider the sentence, 'But as soon as he told me (for Cleon had come begging and praying), took them along and set out.' In this sentence many connecting words are inserted in front of the one required to complete the sense; and if there is a long interval before 'set out', the result is obscurity. One merit, then, of good style lies in the right use of connecting words. (2) The second lies in calling things by their own special names and not by vague general ones. (3) The third is to avoid ambiguities; unless, indeed, you definitely desire to be ambiguous, as those do who have nothing to say but are pretending to mean something. Such people are apt to put that sort of thing into verse. Empedocles, for instance, by his long circumlocutions imposes on his hearers; these are affected in the same way as most people are when they listen to diviners, whose ambiguous utterances are received with nods of acquiescence –

Croesus by crossing the Halys will ruin a mighty realm.

Diviners use these vague generalities about the matter in hand because their predictions are thus, as a rule, less likely to be falsified. We are more likely to be right, in the game of 'odd and even', if we simply guess 'even' or 'odd' than if we guess at the actual number;

and the oracle-monger is more likely to be right if he simply says that a thing will happen than if he says when it will happen, and therefore he refuses to add a definite date. All these ambiguities have the same sort of effect, and are to be avoided unless we have some such object as that mentioned. (4) A fourth rule is to observe Protagoras' classification of nouns into male, female, and inanimate; for these distinctions also must be correctly given. 'Upon her arrival she said her say and departed (e d elthousa kai dialechtheisa ocheto).' (5) A fifth rule is to express plurality, fewness, and unity by the correct wording, e.g. 'Having come, they struck me (oi d elthontes etupton me).'

It is a general rule that a written composition should be easy to read and therefore easy to deliver. This cannot be so where there are many connecting words or clauses, or where punctuation is hard, as in the writings of Heracleitus. To punctuate Heracleitus is no easy task, because we often cannot tell whether a particular word belongs to what precedes or what follows it. Thus, at the outset of his treatise he says, 'Though this truth is always men understand it not', where it is not clear with which of the two clauses the word 'always' should be joined by the punctuation. Further, the following fact leads to solecism, viz. that the sentence does not work out properly if you annex to two terms a third which does not suit them both. Thus either 'sound' or 'colour' will fail to work out properly with some verbs: 'perceive' will apply to both, 'see' will not. Obscurity is also caused if, when you intend to insert a number of details, you do not first make your meaning clear; for instance, if you say, 'I meant, after telling him this, that and the other thing, to set out', rather than something of this kind 'I meant to set out after telling him; then this, that, and the other thing occurred.'

6

The following suggestions will help to give your language impressiveness. (1) Describe a thing instead of naming it: do not say

‘circle’, but ‘that surface which extends equally from the middle every way’. To achieve conciseness, do the opposite – put the name instead of the description. When mentioning anything ugly or unseemly, use its name if it is the description that is ugly, and describe it if it is the name that is ugly. (2) Represent things with the help of metaphors and epithets, being careful to avoid poetical effects. (3) Use plural for singular, as in poetry, where one finds

Unto havens Achaean, though only one haven is meant, and

Here are my letter’s many-leaved folds.

(4) Do not bracket two words under one article, but put one article with each; e.g. ‘that wife of ours.’ The reverse to secure conciseness; e.g. ‘our wife.’ Use plenty of connecting words; conversely, to secure conciseness, dispense with connectives, while still preserving connexion; e.g. ‘having gone and spoken’, and ‘having gone, I spoke’, respectively. (6) And the practice of Antimachus, too, is useful – to describe a thing by mentioning attributes it does not possess; as he does in talking of Teumessus

There is a little wind-swept knoll... A subject can be developed indefinitely along these lines. You may apply this method of treatment by negation either to good or to bad qualities, according to which your subject requires. It is from this source that the poets draw expressions such as the ‘stringless’ or ‘lyreless’ melody, thus forming epithets out of negations. This device is popular in proportional metaphors, as when the trumpet’s note is called ‘a lyreless melody’.

7

Your language will be appropriate if it expresses emotion and character, and if it corresponds to its subject. ‘Correspondence to subject’ means that we must neither speak casually about weighty matters, nor solemnly about trivial ones; nor must we add ornamental epithets to commonplace nouns, or the effect will be

comic, as in the works of Cleophon, who can use phrases as absurd as 'O queenly fig-tree'. To express emotion, you will employ the language of anger in speaking of outrage; the language of disgust and discreet reluctance to utter a word when speaking of impiety or foulness; the language of exultation for a tale of glory, and that of humiliation for a tale of and so in all other cases.

This aptness of language is one thing that makes people believe in the truth of your story: their minds draw the false conclusion that you are to be trusted from the fact that others behave as you do when things are as you describe them; and therefore they take your story to be true, whether it is so or not. Besides, an emotional speaker always makes his audience feel with him, even when there is nothing in his arguments; which is why many speakers try to overwhelm their audience by mere noise.

Furthermore, this way of proving your story by displaying these signs of its genuineness expresses your personal character. Each class of men, each type of disposition, will have its own appropriate way of letting the truth appear. Under 'class' I include differences of age, as boy, man, or old man; of sex, as man or woman; of nationality, as Spartan or Thessalian. By 'dispositions' I here mean those dispositions only which determine the character of a man's for it is not every disposition that does this. If, then, a speaker uses the very words which are in keeping with a particular disposition, he will reproduce the corresponding character; for a rustic and an educated man will not say the same things nor speak in the same way. Again, some impression is made upon an audience by a device which speech-writers employ to nauseous excess, when they say 'Who does not know this?' or 'It is known to everybody.' The hearer is ashamed of his ignorance, and agrees with the speaker, so as to have a share of the knowledge that everybody else possesses.

All the variations of oratorical style are capable of being used in season or out of season. The best way to counteract any exaggeration is the well-worn device by which the speaker puts in some criticism of himself; for then people feel it must be all right for him to talk thus, since he certainly knows what he is doing. Further, it is better

not to have everything always just corresponding to everything else – your hearers will see through you less easily thus. I mean for instance, if your words are harsh, you should not extend this harshness to your voice and your countenance and have everything else in keeping. If you do, the artificial character of each detail becomes apparent; whereas if you adopt one device and not another, you are using art all the same and yet nobody notices it. (To be sure, if mild sentiments are expressed in harsh tones and harsh sentiments in mild tones, you become comparatively unconvincing.) Compound words, fairly plentiful epithets, and strange words best suit an emotional speech. We forgive an angry man for talking about a wrong as 'heaven-high' or 'colossal'; and we excuse such language when the speaker has his hearers already in his hands and has stirred them deeply either by praise or blame or anger or affection, as Isocrates, for instance, does at the end of his Panegyric, with his 'name and fame' and 'in that they brooked'. Men do speak in this strain when they are deeply stirred, and so, once the audience is in a like state of feeling, approval of course follows. This is why such language is fitting in poetry, which is an inspired thing. This language, then, should be used either under stress of emotion, or ironically, after the manner of Gorgias and of the passages in the Phaedrus.

8

The form of a prose composition should be neither metrical nor destitute of rhythm. The metrical form destroys the hearer's trust by its artificial appearance, and at the same time it diverts his attention, making him watch for metrical recurrences, just as children catch up the herald's question, 'Whom does the freedman choose as his advocate?', with the answer 'Cleon!' On the other hand, unrhythmical language is too unlimited; we do not want the limitations of metre, but some limitation we must have, or the effect will be vague and unsatisfactory. Now it is number that limits all things; and it is the numerical limitation of the forms of a composition that constitutes rhythm, of which metres are definite sections. Prose, then, is to be

rhythmical, but not metrical, or it will become not prose but verse. It should not even have too precise a prose rhythm, and therefore should only be rhythmical to a certain extent.

Of the various rhythms, the heroic has dignity, but lacks the tones of the spoken language. The iambic is the very language of ordinary people, so that in common talk iambic lines occur oftener than any others: but in a speech we need dignity and the power of taking the hearer out of his ordinary self. The trochee is too much akin to wild dancing: we can see this in tetrameter verse, which is one of the trochaic rhythms.

There remains the paean, which speakers began to use in the time of Thrasymachus, though they had then no name to give it. The paean is a third class of rhythm, closely akin to both the two already mentioned; it has in it the ratio of three to two, whereas the other two kinds have the ratio of one to one, and two to one respectively. Between the two last ratios comes the ratio of one-and-a-half to one, which is that of the paean.

Now the other two kinds of rhythm must be rejected in writing prose, partly for the reasons given, and partly because they are too metrical; and the paean must be adopted, since from this alone of the rhythms mentioned no definite metre arises, and therefore it is the least obtrusive of them. At present the same form of paean is employed at the beginning a at the end of sentences, whereas the end should differ from the beginning. There are two opposite kinds of paean, one of which is suitable to the beginning of a sentence, where it is indeed actually used; this is the kind that begins with a long syllable and ends with three short ones, as

Dalogenes | eite Luki | an, and

Chruseokom | a Ekate | pai Dios. The other paean begins, conversely, with three short syllables and ends with a long one, as

meta de lan | udata t ok | eanon e | oanise nux. This kind of paean makes a real close: a short syllable can give no effect of finality, and therefore makes the rhythm appear truncated. A sentence should

break off with the long syllable: the fact that it is over should be indicated not by the scribe, or by his period-mark in the margin, but by the rhythm itself.

We have now seen that our language must be rhythmical and not destitute of rhythm, and what rhythms, in what particular shape, make it so.

9

The language of prose must be either free-running, with its parts united by nothing except the connecting words, like the preludes in dithyrambs; or compact and antithetical, like the strophes of the old poets. The free-running style is the ancient one, e.g. 'Herein is set forth the inquiry of Herodotus the Thurian.' Every one used this method formerly; not many do so now. By 'free-running' style I mean the kind that has no natural stopping-places, and comes to a stop only because there is no more to say of that subject. This style is unsatisfying just because it goes on indefinitely – one always likes to sight a stopping-place in front of one: it is only at the goal that men in a race faint and collapse; while they see the end of the course before them, they can keep on going. Such, then, is the free-running kind of style; the compact is that which is in periods. By a period I mean a portion of speech that has in itself a beginning and an end, being at the same time not too big to be taken in at a glance. Language of this kind is satisfying and easy to follow. It is satisfying, because it is just the reverse of indefinite; and moreover, the hearer always feels that he is grasping something and has reached some definite conclusion; whereas it is unsatisfactory to see nothing in front of you and get nowhere. It is easy to follow, because it can easily be remembered; and this because language when in periodic form can be numbered, and number is the easiest of all things to remember. That is why verse, which is measured, is always more easily remembered than prose, which is not: the measures of verse can be numbered. The period must, further, not be completed until

the sense is complete: it must not be capable of breaking off abruptly, as may happen with the following iambic lines of Sophocles –

Calydon's soil is this; of Pelops' land

(The smiling plains face us across the strait.)

By a wrong division of the words the hearer may take the meaning to be the reverse of what it is: for instance, in the passage quoted, one might imagine that Calydon is in the Peloponnesus.

A Period may be either divided into several members or simple. The period of several members is a portion of speech (1) complete in itself, (2) divided into parts, and (3) easily delivered at a single breath – as a whole, that is; not by fresh breath being taken at the division. A member is one of the two parts of such a period. By a 'simple' period, I mean that which has only one member. The members, and the whole periods, should be neither curt nor long. A member which is too short often makes the listener stumble; he is still expecting the rhythm to go on to the limit his mind has fixed for it; and if meanwhile he is pulled back by the speaker's stopping, the shock is bound to make him, so to speak, stumble. If, on the other hand, you go on too long, you make him feel left behind, just as people who when walking pass beyond the boundary before turning back leave their companions behind So too if a period is too long you turn it into a speech, or something like a dithyrambic prelude. The result is much like the preludes that Democritus of Chios jeered at Melanippides for writing instead of antistrophic stanzas –

He that sets traps for another man's feet

Is like to fall into them first;

And long-winded preludes do harm to us all,

But the preluder catches it worst. Which applies likewise to long-membered orators. Periods whose members are altogether too short are not periods at all; and the result is to bring the hearer down with a crash.

The periodic style which is divided into members is of two kinds. It is either simply divided, as in 'I have often wondered at the conveners of national gatherings and the founders of athletic contests'; or it is antithetical, where, in each of the two members, one of one pair of opposites is put along with one of another pair, or the same word is used to bracket two opposites, as 'They aided both parties – not only those who stayed behind but those who accompanied them: for the latter they acquired new territory larger than that at home, and to the former they left territory at home that was large enough'. Here the contrasted words are 'staying behind' and 'accompanying', 'enough' and 'larger'. So in the example, 'Both to those who want to get property and to those who desire to enjoy it' where 'enjoyment' is contrasted with 'getting'. Again, 'it often happens in such enterprises that the wise men fail and the fools succeed'; 'they were awarded the prize of valour immediately, and won the command of the sea not long afterwards'; 'to sail through the mainland and march through the sea, by bridging the Hellespont and cutting through Athos'; 'nature gave them their country and law took it away again'; 'of them perished in misery, others were saved in disgrace'; 'Athenian citizens keep foreigners in their houses as servants, while the city of Athens allows her allies by thousands to live as the foreigner's slaves'; and 'to possess in life or to bequeath at death'. There is also what some one said about Peitholaus and Lycophron in a law-court, 'These men used to sell you when they were at home, and now they have come to you here and bought you'. All these passages have the structure described above. Such a form of speech is satisfying, because the significance of contrasted ideas is easily felt, especially when they are thus put side by side, and also because it has the effect of a logical argument; it is by putting two opposing conclusions side by side that you prove one of them false.

Such, then, is the nature of antithesis. Parisosis is making the two members of a period equal in length. Paromoeosis is making the extreme words of both members like each other. This must happen either at the beginning or at the end of each member. If at the beginning, the resemblance must always be between whole words; at the end, between final syllables or inflexions of the same word or the same word repeated. Thus, at the beginning

agron gar elaben arlon par’ autou and

dorhetoi t epelonto pararretoi t epeessin At the end

ouk wethesan auton paidion tetokenai,

all autou aitlon lelonenai, and

en pleiotals de opontisi kai en elachistais elpisin An example of inflexions of the same word is

axios de staoenai chalkous ouk axios on chalkou; Of the same word repeated,

su d’ auton kai zonta eleges kakos kai nun grafeis kakos. Of one syllable,

ti d’ an epaoes deinon, ei andrh’ eides arhgon; It is possible for the same sentence to have all these features together – antithesis, parison, and homoeoteleuton. (The possible beginnings of periods have been pretty fully enumerated in the Theodectea.) There are also spurious antitheses, like that of Epicharmus –

There one time I as their guest did stay,

And they were my hosts on another day.

10

We may now consider the above points settled, and pass on to say something about the way to devise lively and taking sayings. Their actual invention can only come through natural talent or long practice; but this treatise may indicate the way it is done. We may deal with them by enumerating the different kinds of them. We will begin by remarking that we all naturally find it agreeable to get hold of new ideas easily: words express ideas, and therefore those words are the most agreeable that enable us to get hold of new ideas. Now

strange words simply puzzle us; ordinary words convey only what we know already; it is from metaphor that we can best get hold of something fresh. When the poet calls 'old age a withered stalk', he conveys a new idea, a new fact, to us by means of the general notion of bloom, which is common to both things. The similes of the poets do the same, and therefore, if they are good similes, give an effect of brilliance. The simile, as has been said before, is a metaphor, differing from it only in the way it is put; and just because it is longer it is less attractive. Besides, it does not say outright that 'this' is 'that', and therefore the hearer is less interested in the idea. We see, then, that both speech and reasoning are lively in proportion as they make us seize a new idea promptly. For this reason people are not much taken either by obvious arguments (using the word 'obvious' to mean what is plain to everybody and needs no investigation), nor by those which puzzle us when we hear them stated, but only by those which convey their information to us as soon as we hear them, provided we had not the information already; or which the mind only just fails to keep up with. These two kinds do convey to us a sort of information: but the obvious and the obscure kinds convey nothing, either at once or later on. It is these qualities, then, that, so far as the meaning of what is said is concerned, make an argument acceptable. So far as the style is concerned, it is the antithetical form that appeals to us, e.g. 'judging that the peace common to all the rest was a war upon their own private interests', where there is an antithesis between war and peace. It is also good to use metaphorical words; but the metaphors must not be far-fetched, or they will be difficult to grasp, nor obvious, or they will have no effect. The words, too, ought to set the scene before our eyes; for events ought to be seen in progress rather than in prospect. So we must aim at these three points: Antithesis, Metaphor, and Actuality.

Of the four kinds of Metaphor the most taking is the proportional kind. Thus Pericles, for instance, said that the vanishing from their country of the young men who had fallen in the war was 'as if the spring were taken out of the year'. Leptines, speaking of the Lacedaemonians, said that he would not have the Athenians let Greece 'lose one of her two eyes'. When Chares was pressing for leave to be examined upon his share in the Olynthiac war, Cephisodotus

was indignant, saying that he wanted his examination to take place 'while he had his fingers upon the people's throat'. The same speaker once urged the Athenians to march to Euboea, 'with Miltiades' decree as their rations'. Iphicrates, indignant at the truce made by the Athenians with Epidaurus and the neighbouring sea-board, said that they had stripped themselves of their travelling money for the journey of war. Peitholaus called the state-galley 'the people's big stick', and Sestos 'the corn-bin of the Peiraeus'. Pericles bade his countrymen remove Aegina, 'that eyesore of the Peiraeus.' And Moerocles said he was no more a rascal than was a certain respectable citizen he named, 'whose rascality was worth over thirty per cent per annum to him, instead of a mere ten like his own'.There is also the iambic line of Anaxandrides about the way his daughters put off marrying –

My daughters' marriage-bonds are overdue.

Polyeuctus said of a paralytic man named Speusippus that he could not keep quiet, 'though fortune had fastened him in the pillory of disease'. Cephisodotus called warships 'painted millstones'. Diogenes the Dog called taverns 'the mess-rooms of Attica'. Aesion said that the Athenians had 'emptied' their town into Sicily: this is a graphic metaphor. 'Till all Hellas shouted aloud' may be regarded as a metaphor, and a graphic one again. Cephisodotus bade the Athenians take care not to hold too many 'parades'. Isocrates used the same word of those who 'parade at the national festivals.' Another example occurs in the Funeral Speech: 'It is fitting that Greece should cut off her hair beside the tomb of those who fell at Salamis, since her freedom and their valour are buried in the same grave.' Even if the speaker here had only said that it was right to weep when valour was being buried in their grave, it would have been a metaphor, and a graphic one; but the coupling of 'their valour' and 'her freedom' presents a kind of antithesis as well. 'The course of my words', said Iphicrates, 'lies straight through the middle of Chares' deeds': this is a proportional metaphor, and the phrase 'straight through the middle' makes it graphic. The expression 'to call in one danger to rescue us from another' is a graphic metaphor. Lycoleon said, defending Chabrias, 'They did not respect even that bronze statue of

his that intercedes for him yonder'.This was a metaphor for the moment, though it would not always apply; a vivid metaphor, however; Chabrias is in danger, and his statue intercedes for him – that lifeless yet living thing which records his services to his country. 'Practising in every way littleness of mind' is metaphorical, for practising a quality implies increasing it. So is 'God kindled our reason to be a lamp within our soul', for both reason and light reveal things. So is 'we are not putting an end to our wars, but only postponing them', for both literal postponement and the making of such a peace as this apply to future action. So is such a saying as 'This treaty is a far nobler trophy than those we set up on fields of battle; they celebrate small gains and single successes; it celebrates our triumph in the war as a whole'; for both trophy and treaty are signs of victory. So is 'A country pays a heavy reckoning in being condemned by the judgement of mankind', for a reckoning is damage deservedly incurred.

11

It has already been mentioned that liveliness is got by using the proportional type of metaphor and being making (ie. making your hearers see things). We have still to explain what we mean by their 'seeing things', and what must be done to effect this. By 'making them see things' I mean using expressions that represent things as in a state of activity. Thus, to say that a good man is 'four-square' is certainly a metaphor; both the good man and the square are perfect; but the metaphor does not suggest activity. On the other hand, in the expression 'with his vigour in full bloom' there is a notion of activity; and so in 'But you must roam as free as a sacred victim'; and in

Thereas up sprang the Hellenes to their feet,

where 'up sprang' gives us activity as well as metaphor, for it at once suggests swiftness. So with Homer's common practice of giving

metaphorical life to lifeless things: all such passages are distinguished by the effect of activity they convey. Thus,

Downward anon to the valley rebounded the boulder remorseless; and

The (bitter) arrow flew; and

Flying on eagerly; and

Stuck in the earth, still panting to feed on the flesh of the heroes; and

And the point of the spear in its fury drove full through his breastbone.

In all these examples the things have the effect of being active because they are made into living beings; shameless behaviour and fury and so on are all forms of activity. And the poet has attached these ideas to the things by means of proportional metaphors: as the stone is to Sisyphus, so is the shameless man to his victim. In his famous similes, too, he treats inanimate things in the same way:

Curving and crested with white, host following host without ceasing.

Here he represents everything as moving and living; and activity is movement.

Metaphors must be drawn, as has been said already, from things that are related to the original thing, and yet not obviously so related – just as in philosophy also an acute mind will perceive resemblances even in things far apart. Thus Archytas said that an arbitrator and an altar were the same, since the injured fly to both for refuge. Or you might say that an anchor and an overhead hook were the same, since both are in a way the same, only the one secures things from below and the other from above. And to speak of states as ‘levelled’ is to identify two widely different things, the equality of a physical surface and the equality of political powers.

Liveliness is specially conveyed by metaphor, and by the further power of surprising the hearer; because the hearer expected

something different, his acquisition of the new idea impresses him all the more. His mind seems to say, 'Yes, to be sure; I never thought of that'. The liveliness of epigrammatic remarks is due to the meaning not being just what the words say: as in the saying of Stesichorus that 'the cicalas will chirp to themselves on the ground'. Well-constructed riddles are attractive for the same reason; a new idea is conveyed, and there is metaphorical expression. So with the 'novelties' of Theodorus. In these the thought is startling, and, as Theodorus puts it, does not fit in with the ideas you already have. They are like the burlesque words that one finds in the comic writers. The effect is produced even by jokes depending upon changes of the letters of a word; this too is a surprise. You find this in verse as well as in prose. The word which comes is not what the hearer imagined: thus

Onward he came, and his feet were shod with his-chilblains, where one imagined the word would be 'sandals'. But the point should be clear the moment the words are uttered. Jokes made by altering the letters of a word consist in meaning, not just what you say, but something that gives a twist to the word used; e.g. the remark of Theodorus about Nicon the harpist Thratt' ei su ('you Thracian slavey'), where he pretends to mean Thratteis su ('you harpplayer'), and surprises us when we find he means something else. So you enjoy the point when you see it, though the remark will fall flat unless you are aware that Nicon is Thracian. Or again: Boulei auton persai. In both these cases the saying must fit the facts. This is also true of such lively remarks as the one to the effect that to the Athenians their empire (arche) of the sea was not the beginning (arche) of their troubles, since they gained by it. Or the opposite one of Isocrates, that their empire (arche) was the beginning (arche) of their troubles. Either way, the speaker says something unexpected, the soundness of which is thereupon recognized. There would be nothing clever is saying 'empire is empire'. Isocrates means more than that, and uses the word with a new meaning. So too with the former saying, which denies that arche in one sense was arche in another sense. In all these jokes, whether a word is used in a second sense or metaphorically, the joke is good if it fits the facts. For instance, Anaschetos (proper name) ouk anaschetos: where you say

that what is so-and-so in one sense is not so-and-so in another; well, if the man is unpleasant, the joke fits the facts. Again, take –

Thou must not be a stranger stranger than Thou should'st.

Do not the words 'thou must not be', &c., amount to saying that the stranger must not always be strange? Here again is the use of one word in different senses. Of the same kind also is the much-praised verse of Anaxandrides:

Death is most fit before you do

Deeds that would make death fit for you. This amounts to saying 'it is a fit thing to die when you are not fit to die', or 'it is a fit thing to die when death is not fit for you', i.e. when death is not the fit return for what you are doing. The type of language employed is the same in all these examples; but the more briefly and antithetically such sayings can be expressed, the more taking they are, for antithesis impresses the new idea more firmly and brevity more quickly. They should always have either some personal application or some merit of expression, if they are to be true without being commonplace – two requirements not always satisfied simultaneously. Thus 'a man should die having done no wrong' is true but dull: 'the right man should marry the right woman' is also true but dull. No, there must be both good qualities together, as in 'it is fitting to die when you are not fit for death'. The more a saying has these qualitis, the livelier it appears: if, for instance, its wording is metaphorical, metaphorical in the right way, antithetical, and balanced, and at the same time it gives an idea of activity.

Successful similes also, as has been said above, are in a sense metaphors, since they always involve two relations like the proportional metaphor. Thus: a shield, we say, is the 'drinking-bowl of Ares', and a bow is the 'chordless lyre'. This way of putting a metaphor is not 'simple', as it would be if we called the bow a lyre or the shield a drinking-bowl. There are 'simple' similes also: we may say that a flute-player is like a monkey, or that a short-sighted man's eyes are like a lamp-flame with water dropping on it, since both eyes and flame keep winking. A simile succeeds best when it is a

converted metaphor, for it is possible to say that a shield is like the drinking-bowl of Ares, or that a ruin is like a house in rags, and to say that Niceratus is like a Philoctetes stung by Pratys – the simile made by Thrasyniachus when he saw Niceratus, who had been beaten by Pratys in a recitation competition, still going about unkempt and unwashed. It is in these respects that poets fail worst when they fail, and succeed best when they succeed, i.e. when they give the resemblance pat, as in

Those legs of his curl just like parsley leaves; and

Just like Philammon struggling with his punchball.

These are all similes; and that similes are metaphors has been stated often already.

Proverbs, again, are metaphors from one species to another. Suppose, for instance, a man to start some undertaking in hope of gain and then to lose by it later on, 'Here we have once more the man of Carpathus and his hare', says he. For both alike went through the said experience.

It has now been explained fairly completely how liveliness is secured and why it has the effect it has. Successful hyperboles are also metaphors, e.g. the one about the man with a black eye, 'you would have thought he was a basket of mulberries'; here the 'black eye' is compared to a mulberry because of its colour, the exaggeration lying in the quantity of mulberries suggested. The phrase 'like so-and-so' may introduce a hyperbole under the form of a simile. Thus

Just like Philammon struggling with his punchball is equivalent to 'you would have thought he was Philammon struggling with his punchball'; and

Those legs of his curl just like parsley leaves is equivalent to 'his legs are so curly that you would have thought they were not legs but parsley leaves'. Hyperboles are for young men to use; they show vehemence of character; and this is why angry people use them more than other people.

Not though he gave me as much as the dust

or the sands of the sea...

But her, the daughter of Atreus' son, I never will marry,

Nay, not though she were fairer than Aphrodite the Golden,

Defter of hand than Athene...

(The Attic orators are particularly fond of this method of speech.) Consequently it does not suit an elderly speaker.

12

It should be observed that each kind of rhetoric has its own appropriate style. The style of written prose is not that of spoken oratory, nor are those of political and forensic speaking the same. Both written and spoken have to be known. To know the latter is to know how to speak good Greek. To know the former means that you are not obliged, as otherwise you are, to hold your tongue when you wish to communicate something to the general public.

The written style is the more finished: the spoken better admits of dramatic delivery – like the kind of oratory that reflects character and the kind that reflects emotion. Hence actors look out for plays written in the latter style, and poets for actors competent to act in such plays. Yet poets whose plays are meant to be read are read and circulated: Chaeremon, for instance, who is as finished as a professional speech-writer; and Licymnius among the dithyrambic poets. Compared with those of others, the speeches of professional writers sound thin in actual contests. Those of the orators, on the other hand, are good to hear spoken, but look amateurish enough when they pass into the hands of a reader. This is just because they are so well suited for an actual tussle, and therefore contain many dramatic touches, which, being robbed of all dramatic rendering, fail

to do their own proper work, and consequently look silly. Thus strings of unconnected words, and constant repetitions of words and phrases, are very properly condemned in written speeches: but not in spoken speeches – speakers use them freely, for they have a dramatic effect. In this repetition there must be variety of tone, paving the way, as it were, to dramatic effect; e.g. 'This is the villain among you who deceived you, who cheated you, who meant to betray you completely'. This is the sort of thing that Philemon the actor used to do in the Old Men's Madness of Anaxandrides whenever he spoke the words 'Rhadamanthus and Palamedes', and also in the prologue to the Saints whenever he pronounced the pronoun 'I'. If one does not deliver such things cleverly, it becomes a case of 'the man who swallowed a poker'. So too with strings of unconnected words, e.g.'I came to him; I met him; I besought him'. Such passages must be acted, not delivered with the same quality and pitch of voice, as though they had only one idea in them. They have the further peculiarity of suggesting that a number of separate statements have been made in the time usually occupied by one. Just as the use of conjunctions makes many statements into a single one, so the omission of conjunctions acts in the reverse way and makes a single one into many. It thus makes everything more important: e.g. 'I came to him; I talked to him; I entreated him' – what a lot of facts! the hearer thinks – 'he paid no attention to anything I said'. This is the effect which Homer seeks when he writes,

Nireus likewise from Syme (three well-fashioned ships did bring),

Nireus, the son of Aglaia (and Charopus, bright-faced king),

Nireus, the comeliest man (of all that to Ilium's strand).

If many things are said about a man, his name must be mentioned many times; and therefore people think that, if his name is mentioned many times, many things have been said about him. So that Homer, by means of this illusion, has made a great deal of though he has mentioned him only in this one passage, and has preserved his memory, though he nowhere says a word about him afterwards.

Now the style of oratory addressed to public assemblies is really just like scene-painting. The bigger the throng, the more distant is the point of view: so that, in the one and the other, high finish in detail is superfluous and seems better away. The forensic style is more highly finished; still more so is the style of language addressed to a single judge, with whom there is very little room for rhetorical artifices, since he can take the whole thing in better, and judge of what is to the point and what is not; the struggle is less intense and so the judgement is undisturbed. This is why the same speakers do not distinguish themselves in all these branches at once; high finish is wanted least where dramatic delivery is wanted most, and here the speaker must have a good voice, and above all, a strong one. It is ceremonial oratory that is most literary, for it is meant to be read; and next to it forensic oratory.

To analyse style still further, and add that it must be agreeable or magnificent, is useless; for why should it have these traits any more than 'restraint', 'liberality', or any other moral excellence? Obviously agreeableness will be produced by the qualities already mentioned, if our definition of excellence of style has been correct. For what other reason should style be 'clear', and 'not mean' but 'appropriate'? If it is prolix, it is not clear; nor yet if it is curt. Plainly the middle way suits best. Again, style will be made agreeable by the elements mentioned, namely by a good blending of ordinary and unusual words, by the rhythm, and by the persuasiveness that springs from appropriateness.

This concludes our discussion of style, both in its general aspects and in its special applications to the various branches of rhetoric. We have now to deal with Arrangement.

13

A speech has two parts. You must state your case, and you must prove it. You cannot either state your case and omit to prove it, or

prove it without having first stated it; since any proof must be a proof of something, and the only use of a preliminary statement is the proof that follows it. Of these two parts the first part is called the Statement of the case, the second part the Argument, just as we distinguish between Enunciation and Demonstration. The current division is absurd. For 'narration' surely is part of a forensic speech only: how in a political speech or a speech of display can there be 'narration' in the technical sense? or a reply to a forensic opponent? or an epilogue in closely-reasoned speeches? Again, introduction, comparison of conflicting arguments, and recapitulation are only found in political speeches when there is a struggle between two policies. They may occur then; so may even accusation and defence, often enough; but they form no essential part of a political speech. Even forensic speeches do not always need epilogues; not, for instance, a short speech, nor one in which the facts are easy to remember, the effect of an epilogue being always a reduction in the apparent length. It follows, then, that the only necessary parts of a speech are the Statement and the Argument. These are the essential features of a speech; and it cannot in any case have more than Introduction, Statement, Argument, and Epilogue. 'Refutation of the Opponent' is part of the arguments: so is 'Comparison' of the opponent's case with your own, for that process is a magnifying of your own case and therefore a part of the arguments, since one who does this proves something. The Introduction does nothing like this; nor does the Epilogue – it merely reminds us of what has been said already. If we make such distinctions we shall end, like Theodorus and his followers, by distinguishing 'narration' proper from 'post-narration' and 'pre-narration', and 'refutation' from 'final refutation'. But we ought only to bring in a new name if it indicates a real species with distinct specific qualities; otherwise the practice is pointless and silly, like the way Licymnius invented names in his Art of Rhetoric – 'Secundation', 'Divagation', 'Ramification'.

14

The Introduction is the beginning of a speech, corresponding to the prologue in poetry and the prelude in flute-music; they are all beginnings, paving the way, as it were, for what is to follow. The musical prelude resembles the introduction to speeches of display; as flute players play first some brilliant passage they know well and then fit it on to the opening notes of the piece itself, so in speeches of display the writer should proceed in the same way; he should begin with what best takes his fancy, and then strike up his theme and lead into it; which is indeed what is always done. (Take as an example the introduction to the Helen of Isocrates – there is nothing in common between the 'eristics' and Helen.) And here, even if you travel far from your subject, it is fitting, rather than that there should be sameness in the entire speech.

The usual subject for the introductions to speeches of display is some piece of praise or censure. Thus Gorgias writes in his Olympic Speech, 'You deserve widespread admiration, men of Greece', praising thus those who start,ed the festival gatherings.' Isocrates, on the other hand, censures them for awarding distinctions to fine athletes but giving no prize for intellectual ability. Or one may begin with a piece of advice, thus: 'We ought to honour good men and so I myself am praising Aristeides' or 'We ought to honour those who are unpopular but not bad men, men whose good qualities have never been noticed, like Alexander son of Priam.' Here the orator gives advice. Or we may begin as speakers do in the law-courts; that is to say, with appeals to the audience to excuse us if our speech is about something paradoxical, difficult, or hackneyed; like Choerilus in the lines –

But now when allotment of all has been made...

Introductions to speeches of display, then, may be composed of some piece of praise or censure, of advice to do or not to do something, or of appeals to the audience; and you must choose between making these preliminary passages connected or disconnected with the speech itself.

Introductions to forensic speeches, it must be observed, have the same value as the prologues of dramas and the introductions to epic poems; the dithyrambic prelude resembling the introduction to a speech of display, as

For thee, and thy gilts, and thy battle-spoils....

In prologues, and in epic poetry, a foretaste of the theme is given, intended to inform the hearers of it in advance instead of keeping their minds in suspense. Anything vague puzzles them: so give them a grasp of the beginning, and they can hold fast to it and follow the argument. So we find –

Sing, O goddess of song, of the Wrath...

Tell me, O Muse, of the hero...

Lead me to tell a new tale, how there came great warfare to Europe

Out of the Asian land...

The tragic poets, too, let us know the pivot of their play; if not at the outset like Euripides, at least somewhere in the preface to a speech like Sophocles –

Polybus was my father...; and so in Comedy. This, then, is the most essential function and distinctive property of the introduction, to show what the aim of the speech is; and therefore no introduction ought to be employed where the subject is not long or intricate.

The other kinds of introduction employed are remedial in purpose, and may be used in any type of speech. They are concerned with the speaker, the hearer, the subject, or the speaker's opponent. Those concerned with the speaker himself or with his opponent are directed to removing or exciting prejudice. But whereas the defendant will begin by dealing with this sort of thing, the prosecutor will take quite another line and deal with such matters in the closing part of his speech. The reason for this is not far to seek. The defendant, when he is going to bring himself on the stage, must clear away any obstacles, and therefore must begin by removing any

prejudice felt against him. But if you are to excite prejudice, you must do so at the close, so that the judges may more easily remember what you have said.

The appeal to the hearer aims at securing his goodwill, or at arousing his resentment, or sometimes at gaining his serious attention to the case, or even at distracting it – for gaining it is not always an advantage, and speakers will often for that reason try to make him laugh.

You may use any means you choose to make your hearer receptive; among others, giving him a good impression of your character, which always helps to secure his attention. He will be ready to attend to anything that touches himself and to anything that is important, surprising, or agreeable; and you should accordingly convey to him the impression that what you have to say is of this nature. If you wish to distract his attention, you should imply that the subject does not affect him, or is trivial or disagreeable. But observe, all this has nothing to do with the speech itself. It merely has to do with the weak-minded tendency of the hearer to listen to what is beside the point. Where this tendency is absent, no introduction wanted beyond a summary statement of your subject, to put a sort of head on the main body of your speech. Moreover, calls for attention, when required, may come equally well in any part of a speech; in fact, the beginning of it is just where there is least slackness of interest; it is therefore ridiculous to put this kind of thing at the beginning, when every one is listening with most attention. Choose therefore any point in the speech where such an appeal is needed, and then say 'Now I beg you to note this point – it concerns you quite as much as myself'; or

I will tell you that whose like you have never yet heard for terror, or for wonder. This is what Prodicus called 'slipping in a bit of the fifty-drachma show-lecture for the audience whenever they began to nod'. It is plain that such introductions are addressed not to ideal hearers, but to hearers as we find them. The use of introductions to excite prejudice or to dispel misgivings is universal –

My lord, I will not say that eagerly... or

Why all this preface? Introductions are popular with those whose case is weak, or looks weak; it pays them to dwell on anything rather than the actual facts of it. That is why slaves, instead of answering the questions put to them, make indirect replies with long preambles. The means of exciting in your hearers goodwill and various other feelings of the same kind have already been described. The poet finely says May I find in Phaeacian hearts, at my coming, goodwill and compassion; and these are the two things we should aim at. In speeches of display we must make the hearer feel that the eulogy includes either himself or his family or his way of life or something or other of the kind. For it is true, as Socrates says in the Funeral Speech, that 'the difficulty is not to praise the Athenians at Athens but at Sparta'.

The introductions of political oratory will be made out of the same materials as those of the forensic kind, though the nature of political oratory makes them very rare. The subject is known already, and therefore the facts of the case need no introduction; but you may have to say something on account of yourself or to your opponents; or those present may be inclined to treat the matter either more or less seriously than you wish them to. You may accordingly have to excite or dispel some prejudice, or to make the matter under discussion seem more or less important than before: for either of which purposes you will want an introduction. You may also want one to add elegance to your remarks, feeling that otherwise they will have a casual air, like Gorgias' eulogy of the Eleans, in which, without any preliminary sparring or fencing, he begins straight off with 'Happy city of Elis!'

15

In dealing with prejudice, one class of argument is that whereby you can dispel objectionable suppositions about yourself. It makes no practical difference whether such a supposition has been put into words or not, so that this distinction may be ignored. Another way is

to meet any of the issues directly: to deny the alleged fact; or to say that you have done no harm, or none to him, or not as much as he says; or that you have done him no injustice, or not much; or that you have done nothing disgraceful, or nothing disgraceful enough to matter: these are the sort of questions on which the dispute hinges. Thus Iphicrates replying to Nausicrates, admitted that he had done the deed alleged, and that he had done Nausicrates harm, but not that he had done him wrong. Or you may admit the wrong, but balance it with other facts, and say that, if the deed harmed him, at any rate it was honourable; or that, if it gave him pain, at least it did him good; or something else like that. Another way is to allege that your action was due to mistake, or bad luck, or necessity as Sophocles said he was not trembling, as his traducer maintained, in order to make people think him an old man, but because he could not help it; he would rather not be eighty years old. You may balance your motive against your actual deed; saying, for instance, that you did not mean to injure him but to do so-and-so; that you did not do what you are falsely charged with doing – the damage was accidental – 'I should indeed be a detestable person if I had deliberately intended this result.' Another way is open when your calumniator, or any of his connexions, is or has been subject to the same grounds for suspicion. Yet another, when others are subject to the same grounds for suspicion but are admitted to be in fact innocent of the charge: e.g. 'Must I be a profligate because I am well-groomed? Then so-and-so must be one too.' Another, if other people have been calumniated by the same man or some one else, or, without being calumniated, have been suspected, like yourself now, and yet have been proved innocent. Another way is to return calumny for calumny and say, 'It is monstrous to trust the man's statements when you cannot trust the man himself.' Another is when the question has been already decided. So with Euripides' reply to Hygiaenon, who, in the action for an exchange of properties, accused him of impiety in having written a line encouraging perjury –

My tongue hath sworn: no oath is on my soul.

Euripides said that his opponent himself was guilty in bringing into the law-courts cases whose decision belonged to the Dionysiac

contests. 'If I have not already answered for my words there, I am ready to do so if you choose to prosecute me there.' Another method is to denounce calumny, showing what an enormity it is, and in particular that it raises false issues, and that it means a lack of confidence in the merits of his case. The argument from evidential circumstances is available for both parties: thus in the Teucer Odysseus says that Teucer is closely bound to Priam, since his mother Hesione was Priam's sister. Teucer replies that Telamon his father was Priam's enemy, and that he himself did not betray the spies to Priam. Another method, suitable for the calumniator, is to praise some trifling merit at great length, and then attack some important failing concisely; or after mentioning a number of good qualities to attack one bad one that really bears on the question. This is the method of thoroughly skilful and unscrupulous prosecutors. By mixing up the man's merits with what is bad, they do their best to make use of them to damage him.

There is another method open to both calumniator and apologist. Since a given action can be done from many motives, the former must try to disparage it by selecting the worse motive of two, the latter to put the better construction on it. Thus one might argue that Diomedes chose Odysseus as his companion because he supposed Odysseus to be the best man for the purpose; and you might reply to this that it was, on the contrary, because he was the only hero so worthless that Diomedes need not fear his rivalry.

16

We may now pass from the subject of calumny to that of Narration.

Narration in ceremonial oratory is not continuous but intermittent. There must, of course, be some survey of the actions that form the subject-matter of the speech. The speech is a composition containing two parts. One of these is not provided by the orator's art, viz. the actions themselves, of which the orator is in no sense author. The

other part is provided by his namely, the proof (where proof is needed) that the actions were done, the description of their quality or of their extent, or even all these three things together. Now the reason why sometimes it is not desirable to make the whole narrative continuous is that the case thus expounded is hard to keep in mind. Show, therefore, from one set of facts that your hero is, e.g. brave, and from other sets of facts that he is able, just, &c. A speech thus arranged is comparatively simple, instead of being complicated and elaborate. You will have to recall well-known deeds among others; and because they are well-known, the hearer usually needs no narration of them; none, for instance, if your object is the praise of Achilles; we all know the facts of his life – what you have to do is to apply those facts. But if your object is the praise of Critias, you must narrate his deeds, which not many people know of...

Nowadays it is said, absurdly enough, that the narration should be rapid. Remember what the man said to the baker who asked whether he was to make the cake hard or soft: 'What, can't you make it right?' Just so here. We are not to make long narrations, just as we are not to make long introductions or long arguments. Here, again, rightness does not consist either in rapidity or in conciseness, but in the happy mean; that is, in saying just so much as will make the facts plain, or will lead the hearer to believe that the thing has happened, or that the man has caused injury or wrong to some one, or that the facts are really as important as you wish them to be thought: or the opposite facts to establish the opposite arguments.

You may also narrate as you go anything that does credit to yourself, e.g. 'I kept telling him to do his duty and not abandon his children'; or discredit to your adversary, e.g. 'But he answered me that, wherever he might find himself, there he would find other children', the answer Herodotus' records of the Egyptian mutineers. Slip in anything else that the judges will enjoy.

The defendant will make less of the narration. He has to maintain that the thing has not happened, or did no harm, or was not unjust, or not so bad as is alleged. He must therefor snot waste time about what is admitted fact, unless this bears on his own contention; e.g.

that the thing was done, but was not wrong. Further, we must speak of events as past and gone, except where they excite pity or indignation by being represented as present. The Story told to Alcinous is an example of a brief chronicle, when it is repeated to Penelope in sixty lines. Another instance is the Epic Cycle as treated by Phayllus, and the prologue to the Oeneus.

The narration should depict character; to which end you must know what makes it do so. One such thing is the indication of moral purpose; the quality of purpose indicated determines the quality of character depicted and is itself determined by the end pursued. Thus it is that mathematical discourses depict no character; they have nothing to do with moral purpose, for they represent nobody as pursuing any end. On the other hand, the Socratic dialogues do depict character, being concerned with moral questions. This end will also be gained by describing the manifestations of various types of character, e.g. ‘he kept walking along as he talked’, which shows the man’s recklessness and rough manners. Do not let your words seem inspired so much by intelligence, in the manner now current, as by moral purpose: e.g. ‘I willed this; aye, it was my moral purpose; true, I gained nothing by it, still it is better thus.’ For the other way shows good sense, but this shows good character; good sense making us go after what is useful, and good character after what is noble. Where any detail may appear incredible, then add the cause of it; of this Sophocles provides an example in the Antigone, where Antigone says she had cared more for her brother than for husband or children, since if the latter perished they might be replaced,

But since my father and mother in their graves

Lie dead, no brother can be born to me. If you have no such cause to suggest, just say that you are aware that no one will believe your words, but the fact remains that such is our nature, however hard the world may find it to believe that a man deliberately does anything except what pays him.

Again, you must make use of the emotions. Relate the familiar manifestations of them, and those that distinguish yourself and your opponent; for instance, ‘he went away scowling at me’. So Aeschines

described Cratylus as 'hissing with fury and shaking his fists'. These details carry conviction: the audience take the truth of what they know as so much evidence for the truth of what they do not. Plenty of such details may be found in Homer:

Thus did she say: but the old woman buried her face in her hands: a true touch – people beginning to cry do put their hands over their eyes.

Bring yourself on the stage from the first in the right character, that people may regard you in that light; and the same with your adversary; but do not let them see what you are about. How easily such impressions may be conveyed we can see from the way in which we get some inkling of things we know nothing of by the mere look of the messenger bringing news of them. Have some narrative in many different parts of your speech; and sometimes let there be none at the beginning of it.

In political oratory there is very little opening for narration; nobody can 'narrate' what has not yet happened. If there is narration at all, it will be of past events, the recollection of which is to help the hearers to make better plans for the future. Or it may be employed to attack some one's character, or to eulogize him – only then you will not be doing what the political speaker, as such, has to do.

If any statement you make is hard to believe, you must guarantee its truth, and at once offer an explanation, and then furnish it with such particulars as will be expected. Thus Carcinus' Jocasta, in his Oedipus, keeps guaranteeing the truth of her answers to the inquiries of the man who is seeking her son; and so with Haemon in Sophocles.

17

The duty of the Arguments is to attempt demonstrative proofs. These proofs must bear directly upon the question in dispute, which must

fall under one of four heads. (1) If you maintain that the act was not committed, your main task in court is to prove this. (2) If you maintain that the act did no harm, prove this. If you maintain that (3) the act was less than is alleged, or (4) justified, prove these facts, just as you would prove the act not to have been committed if you were maintaining that.

It should be noted that only where the question in dispute falls under the first of these heads can it be true that one of the two parties is necessarily a rogue. Here ignorance cannot be pleaded, as it might if the dispute were whether the act was justified or not. This argument must therefore be used in this case only, not in the others.

In ceremonial speeches you will develop your case mainly by arguing that what has been done is, e.g., noble and useful. The facts themselves are to be taken on trust; proof of them is only submitted on those rare occasions when they are not easily credible or when they have been set down to some one else.

In political speeches you may maintain that a proposal is impracticable; or that, though practicable, it is unjust, or will do no good, or is not so important as its proposer thinks. Note any falsehoods about irrelevant matters – they will look like proof that his other statements also are false. Argument by 'example' is highly suitable for political oratory, argument by 'enthymeme' better suits forensic. Political oratory deals with future events, of which it can do no more than quote past events as examples. Forensic oratory deals with what is or is not now true, which can better be demonstrated, because not contingent – there is no contingency in what has now already happened. Do not use a continuous succession of enthymemes: intersperse them with other matter, or they will spoil one another's effect. There are limits to their number –

Friend, you have spoken as much as a sensible man would have spoken. 'As much' says Homer, not 'as well'. Nor should you try to make enthymemes on every point; if you do, you will be acting just like some students of philosophy, whose conclusions are more familiar and believable than the premisses from which they draw them. And avoid the enthymeme form when you are trying to rouse

feeling; for it will either kill the feeling or will itself fall flat: all simultaneous motions tend to cancel each other either completely or partially. Nor should you go after the enthymeme form in a passage where you are depicting character – the process of demonstration can express neither moral character nor moral purpose. Maxims should be employed in the Arguments – and in the Narration too – since these do express character: 'I have given him this, though I am quite aware that one should "Trust no man".' Or if you are appealing to the emotions: 'I do not regret it, though I have been wronged; if he has the profit on his side, I have justice on mine.'

Political oratory is a more difficult task than forensic; and naturally so, since it deals with the future, whereas the pleader deals with the past, which, as Epimenides of Crete said, even the diviners already know. (Epimenides did not practise divination about the future; only about the obscurities of the past.) Besides, in forensic oratory you have a basis in the law; and once you have a starting-point, you can prove anything with comparative ease. Then again, political oratory affords few chances for those leisurely digressions in which you may attack your adversary, talk about yourself, or work on your hearers' emotions; fewer chances indeed, than any other affords, unless your set purpose is to divert your hearers' attention. Accordingly, if you find yourself in difficulties, follow the lead of the Athenian speakers, and that of Isocrates, who makes regular attacks upon people in the course of a political speech, e.g. upon the Lacedaemonians in the Panegyricus, and upon Chares in the speech about the allies. In ceremonial oratory, intersperse your speech with bits of episodic eulogy, like Isocrates, who is always bringing some one forward for this purpose. And this is what Gorgias meant by saying that he always found something to talk about. For if he speaks of Achilles, he praises Peleus, then Aeacus, then Zeus; and in like manner the virtue of valour, describing its good results, and saying what it is like.

Now if you have proofs to bring forward, bring them forward, and your moral discourse as well; if you have no enthymemes, then fall back upon moral discourse: after all, it is more fitting for a good man to display himself as an honest fellow than as a subtle reasoner. Refutative enthymemes are more popular than demonstrative ones:

their logical cogency is more striking: the facts about two opposites always stand out clearly when the two are nut side by side.

The 'Reply to the Opponent' is not a separate division of the speech; it is part of the Arguments to break down the opponent's case, whether by objection or by counter-syllogism. Both in political speaking and when pleading in court, if you are the first speaker you should put your own arguments forward first, and then meet the arguments on the other side by refuting them and pulling them to pieces beforehand. If, however, the case for the other side contains a great variety of arguments, begin with these, like Callistratus in the Messenian assembly, when he demolished the arguments likely to be used against him before giving his own. If you speak later, you must first, by means of refutation and counter-syllogism, attempt some answer to your opponent's speech, especially if his arguments have been well received. For just as our minds refuse a favourable reception to a person against whom they are prejudiced, so they refuse it to a speech when they have been favourably impressed by the speech on the other side. You should, therefore, make room in the minds of the audience for your coming speech; and this will be done by getting your opponent's speech out of the way. So attack that first – either the whole of it, or the most important, successful, or vulnerable points in it, and thus inspire confidence in what you have to say yourself –

First, champion will I be of Goddesses...

Never, I ween, would Hera... where the speaker has attacked the silliest argument first. So much for the Arguments.

With regard to the element of moral character: there are assertions which, if made about yourself, may excite dislike, appear tedious, or expose you to the risk of contradiction; and other things which you cannot say about your opponent without seeming abusive or ill-bred. Put such remarks, therefore, into the mouth of some third person. This is what Isocrates does in the Philippus and in the Antidosis, and Archilochus in his satires. The latter represents the father himself as attacking his daughter in the lampoon

Think nought impossible at all,

Nor swear that it shall not befall... and puts into the mouth of Charon the carpenter the lampoon which begins

Not for the wealth of Gyes... So too Sophocles makes Haemon appeal to his father on behalf of Antigone as if it were others who were speaking.

Again, sometimes you should restate your enthymemes in the form of maxims; e.g. 'Wise men will come to terms in the hour of success; for they will gain most if they do'. Expressed as an enthymeme, this would run, 'If we ought to come to terms when doing so will enable us to gain the greatest advantage, then we ought to come to terms in the hour of success.'

18

Next as to Interrogation. The best moment to a employ this is when your opponent has so answered one question that the putting of just one more lands him in absurdity. Thus Pericles questioned Lampon about the way of celebrating the rites of the Saviour Goddess. Lampon declared that no uninitiated person could be told of them. Pericles then asked, 'Do you know them yourself?' 'Yes', answered Lampon. 'Why,' said Pericles, 'how can that be, when you are uninitiated?'

Another good moment is when one premiss of an argument is obviously true, and you can see that your opponent must say 'yes' if you ask him whether the other is true. Having first got this answer about the other, do not go on to ask him about the obviously true one, but just state the conclusion yourself. Thus, when Meletus denied that Socrates believed in the existence of gods but admitted that he talked about a supernatural power, Socrates proceeded to to ask whether 'supernatural beings were not either children of the gods or in some way divine?' 'Yes', said Meletus. 'Then', replied Socrates, 'is

there any one who believes in the existence of children of the gods and yet not in the existence of the gods themselves?' Another good occasion is when you expect to show that your opponent is contradicting either his own words or what every one believes. A fourth is when it is impossible for him to meet your question except by an evasive answer. If he answers 'True, and yet not true', or 'Partly true and partly not true', or 'True in one sense but not in another', the audience thinks he is in difficulties, and applauds his discomfiture. In other cases do not attempt interrogation; for if your opponent gets in an objection, you are felt to have been worsted. You cannot ask a series of questions owing to the incapacity of the audience to follow them; and for this reason you should also make your enthymemes as compact as possible.

In replying, you must meet ambiguous questions by drawing reasonable distinctions, not by a curt answer. In meeting questions that seem to involve you in a contradiction, offer the explanation at the outset of your answer, before your opponent asks the next question or draws his conclusion. For it is not difficult to see the drift of his argument in advance. This point, however, as well as the various means of refutation, may be regarded as known to us from the Topics.

When your opponent in drawing his conclusion puts it in the form of a question, you must justify your answer. Thus when Sophocles was asked by Peisander whether he had, like the other members of the Board of Safety, voted for setting up the Four Hundred, he said 'Yes.' – 'Why, did you not think it wicked?' – 'Yes.' – 'So you committed this wickedness?' – 'Yes', said Sophocles, 'for there was nothing better to do.' Again, the Lacedaemonian, when he was being examined on his conduct as ephor, was asked whether he thought that the other ephors had been justly put to death. 'Yes', he said. 'Well then', asked his opponent, 'did not you propose the same measures as they?' – 'Yes.' – 'Well then, would not you too be justly put to death?' – 'Not at all', said he; 'they were bribed to do it, and I did it from conviction'. Hence you should not ask any further questions after drawing the conclusion, nor put the conclusion itself in the form of a further question, unless there is a large balance of truth on your side.

As to jests. These are supposed to be of some service in controversy. Gorgias said that you should kill your opponents' earnestness with jesting and their jesting with earnestness; in which he was right. jests have been classified in the Poetics. Some are becoming to a gentleman, others are not; see that you choose such as become you. Irony better befits a gentleman than buffoonery; the ironical man jokes to amuse himself, the buffoon to amuse other people.

19

The Epilogue has four parts. You must (1) make the audience well-disposed towards yourself and ill-disposed towards your opponent (2) magnify or minimize the leading facts, (3) excite the required state of emotion in your hearers, and (4) refresh their memories.

(1) Having shown your own truthfulness and the untruthfulness of your opponent, the natural thing is to commend yourself, censure him, and hammer in your points. You must aim at one of two objects – you must make yourself out a good man and him a bad one either in yourselves or in relation to your hearers. How this is to be managed – by what lines of argument you are to represent people as good or bad – this has been already explained.

(2) The facts having been proved, the natural thing to do next is to magnify or minimize their importance. The facts must be admitted before you can discuss how important they are; just as the body cannot grow except from something already present. The proper lines of argument to be used for this purpose of amplification and depreciation have already been set forth.

(3) Next, when the facts and their importance are clearly understood, you must excite your hearers' emotions. These emotions are pity, indignation, anger, hatred, envy, emulation, pugnacity. The lines of argument to be used for these purposes also have been previously mentioned.

(4) Finally you have to review what you have already said. Here you may properly do what some wrongly recommend doing in the introduction – repeat your points frequently so as to make them easily understood. What you should do in your introduction is to state your subject, in order that the point to be judged may be quite plain; in the epilogue you should summarize the arguments by which your case has been proved. The first step in this reviewing process is to observe that you have done what you undertook to do. You must, then, state what you have said and why you have said it. Your method may be a comparison of your own case with that of your opponent; and you may compare either the ways you have both handled the same point or make your comparison less direct: 'My opponent said so-and-so on this point; I said so-and-so, and this is why I said it'. Or with modest irony, e.g. 'He certainly said so-and-so, but I said so-and-so'. Or 'How vain he would have been if he had proved all this instead of that!' Or put it in the form of a question. 'What has not been proved by me?' or 'What has my opponent proved?' You may proceed then, either in this way by setting point against point, or by following the natural order of the arguments as spoken, first giving your own, and then separately, if you wish, those of your opponent.

For the conclusion, the disconnected style of language is appropriate, and will mark the difference between the oration and the peroration. 'I have done. You have heard me. The facts are before you. I ask for your judgement.'

Aristotle – Poetics

[Translated by S. H. Butcher]

1

I propose to treat of Poetry in itself and of its various kinds, noting the essential quality of each, to inquire into the structure of the plot as requisite to a good poem; into the number and nature of the parts of which a poem is composed; and similarly into whatever else falls within the same inquiry. Following, then, the order of nature, let us begin with the principles which come first.

Epic poetry and Tragedy, Comedy also and Dithyrambic poetry, and the music of the flute and of the lyre in most of their forms, are all in their general conception modes of imitation. They differ, however, from one another in three respects – the medium, the objects, the manner or mode of imitation, being in each case distinct.

For as there are persons who, by conscious art or mere habit, imitate and represent various objects through the medium of color and form, or again by the voice; so in the arts above mentioned, taken as a whole, the imitation is produced by rhythm, language, or 'harmony,' either singly or combined.

Thus in the music of the flute and of the lyre, 'harmony' and rhythm alone are employed; also in other arts, such as that of the shepherd's pipe, which are essentially similar to these. In dancing, rhythm alone is used without 'harmony'; for even

dancing imitates character, emotion, and action, by rhythmical movement.

There is another art which imitates by means of language alone, and that either in prose or verse – which verse, again, may either combine different meters or consist of but one kind – but this has hitherto been without a name. For there is no common term we could apply to the mimes of Sophron and Xenarchus and the Socratic dialogues on the one hand; and, on the other, to poetic imitations in iambic, elegiac, or any similar meter. People do, indeed, add the word 'maker' or 'poet' to the name of the meter, and speak of elegiac poets, or epic (that is, hexameter) poets, as if it were not the imitation that makes the poet, but the verse that entitles them all to the name. Even when a treatise on medicine or natural science is brought out in verse, the name of poet is by custom given to the author; and yet Homer and Empedocles have nothing in common but the meter, so that it would be right to call the one poet, the other physicist rather than poet. On the same principle, even if a writer in his poetic imitation were to combine all meters, as Chaeremon did in his Centaur, which is a medley composed of meters of all kinds, we should bring him too under the general term poet.

So much then for these distinctions.

There are, again, some arts which employ all the means above mentioned – namely, rhythm, tune, and meter. Such are Dithyrambic and Nomic poetry, and also Tragedy and Comedy; but between them originally the difference is, that in the first two cases these means are all employed in combination, in the latter, now one means is employed, now another.

Such, then, are the differences of the arts with respect to the medium of imitation.

2

Since the objects of imitation are men in action, and these men must be either of a higher or a lower type (for moral character mainly answers to these divisions, goodness and badness being the distinguishing marks of moral differences), it follows that we must represent men either as better than in real life, or as worse, or as they are. It is the same in painting. Polygnotus depicted men as nobler than they are, Pauson as less noble, Dionysius drew them true to life.

Now it is evident that each of the modes of imitation above mentioned will exhibit these differences, and become a distinct kind in imitating objects that are thus distinct. Such diversities may be found even in dancing, flute-playing, and lyre-playing. So again in language, whether prose or verse unaccompanied by music. Homer, for example, makes men better than they are; Cleophon as they are; Hegemon the Thasian, the inventor of parodies, and Nicochares, the author of the Deiliad, worse than they are. The same thing holds good of Dithyrambs and Nomes; here too one may portray different types, as Timotheus and Philoxenus differed in representing their Cyclopes. The same distinction marks off Tragedy from Comedy; for Comedy aims at representing men as worse, Tragedy as better than in actual life.

3

There is still a third difference – the manner in which each of these objects may be imitated. For the medium being the same,

and the objects the same, the poet may imitate by narration – in which case he can either take another personality as Homer does, or speak in his own person, unchanged – or he may present all his characters as living and moving before us.

These, then, as we said at the beginning, are the three differences which distinguish artistic imitation – the medium, the objects, and the manner. So that from one point of view, Sophocles is an imitator of the same kind as Homer – for both imitate higher types of character; from another point of view, of the same kind as Aristophanes – for both imitate persons acting and doing. Hence, some say, the name of 'drama' is given to such poems, as representing action. For the same reason the Dorians claim the invention both of Tragedy and Comedy. The claim to Comedy is put forward by the Megarians – not only by those of Greece proper, who allege that it originated under their democracy, but also by the Megarians of Sicily, for the poet Epicharmus, who is much earlier than Chionides and Magnes, belonged to that country. Tragedy too is claimed by certain Dorians of the Peloponnese. In each case they appeal to the evidence of language. The outlying villages, they say, are by them called komai, by the Athenians demoi: and they assume that comedians were so named not from komazein, 'to revel,' but because they wandered from village to village (kata komas), being excluded contemptuously from the city. They add also that the Dorian word for 'doing' is dran, and the Athenian, prattein.

This may suffice as to the number and nature of the various modes of imitation.

4

Poetry in general seems to have sprung from two causes, each of them lying deep in our nature. First, the instinct of imitation is implanted in man from childhood, one difference between him and other animals being that he is the most imitative of living creatures, and through imitation learns his earliest lessons; and no less universal is the pleasure felt in things imitated. We have evidence of this in the facts of experience. Objects which in themselves we view with pain, we delight to contemplate when reproduced with minute fidelity: such as the forms of the most ignoble animals and of dead bodies. The cause of this again is, that to learn gives the liveliest pleasure, not only to philosophers but to men in general; whose capacity, however, of learning is more limited. Thus the reason why men enjoy seeing a likeness is, that in contemplating it they find themselves learning or inferring, and saying perhaps, 'Ah, that is he.' For if you happen not to have seen the original, the pleasure will be due not to the imitation as such, but to the execution, the coloring, or some such other cause.

Imitation, then, is one instinct of our nature. Next, there is the instinct for 'harmony' and rhythm, meters being manifestly sections of rhythm. Persons, therefore, starting with this natural gift developed by degrees their special aptitudes, till their rude improvisations gave birth to Poetry.

Poetry now diverged in two directions, according to the individual character of the writers. The graver spirits imitated noble actions, and the actions of good men. The more trivial sort imitated the actions of meaner persons, at first composing satires, as the former did hymns to the gods and the praises of famous men. A poem of the satirical kind cannot indeed be put down to any author earlier than Homer; though many such writers probably there were. But from Homer onward, instances

can be cited – his own Margites, for example, and other similar compositions. The appropriate meter was also here introduced; hence the measure is still called the iambic or lampooning measure, being that in which people lampooned one another. Thus the older poets were distinguished as writers of heroic or of lampooning verse.

As, in the serious style, Homer is pre-eminent among poets, for he alone combined dramatic form with excellence of imitation so he too first laid down the main lines of comedy, by dramatizing the ludicrous instead of writing personal satire. His Margites bears the same relation to comedy that the Iliad and Odyssey do to tragedy. But when Tragedy and Comedy came to light, the two classes of poets still followed their natural bent: the lampooners became writers of Comedy, and the Epic poets were succeeded by Tragedians, since the drama was a larger and higher form of art.

Whether Tragedy has as yet perfected its proper types or not; and whether it is to be judged in itself, or in relation also to the audience – this raises another question. Be that as it may, Tragedy – as also Comedy – was at first mere improvisation. The one originated with the authors of the Dithyramb, the other with those of the phallic songs, which are still in use in many of our cities. Tragedy advanced by slow degrees; each new element that showed itself was in turn developed. Having passed through many changes, it found its natural form, and there it stopped.

Aeschylus first introduced a second actor; he diminished the importance of the Chorus, and assigned the leading part to the dialogue. Sophocles raised the number of actors to three, and added scene-painting. Moreover, it was not till late that the short plot was discarded for one of greater compass, and the grotesque diction of the earlier satyric form for the stately

manner of Tragedy. The iambic measure then replaced the trochaic tetrameter, which was originally employed when the poetry was of the satyric order, and had greater with dancing. Once dialogue had come in, Nature herself discovered the appropriate measure. For the iambic is, of all measures, the most colloquial we see it in the fact that conversational speech runs into iambic lines more frequently than into any other kind of verse; rarely into hexameters, and only when we drop the colloquial intonation. The additions to the number of 'episodes' or acts, and the other accessories of which tradition tells, must be taken as already described; for to discuss them in detail would, doubtless, be a large undertaking.

5

Comedy is, as we have said, an imitation of characters of a lower type – not, however, in the full sense of the word bad, the ludicrous being merely a subdivision of the ugly. It consists in some defect or ugliness which is not painful or destructive. To take an obvious example, the comic mask is ugly and distorted, but does not imply pain.

The successive changes through which Tragedy passed, and the authors of these changes, are well known, whereas Comedy has had no history, because it was not at first treated seriously. It was late before the Archon granted a comic chorus to a poet; the performers were till then voluntary. Comedy had already taken definite shape when comic poets, distinctively so called, are heard of. Who furnished it with masks, or prologues, or increased the number of actors – these and other similar details remain unknown. As for the plot, it came originally from Sicily; but of Athenian writers Crates was the first who abandoning

the ‘iambic’ or lampooning form, generalized his themes and plots.

Epic poetry agrees with Tragedy in so far as it is an imitation in verse of characters of a higher type. They differ in that Epic poetry admits but one kind of meter and is narrative in form. They differ, again, in their length: for Tragedy endeavors, as far as possible, to confine itself to a single revolution of the sun, or but slightly to exceed this limit, whereas the Epic action has no limits of time. This, then, is a second point of difference; though at first the same freedom was admitted in Tragedy as in Epic poetry.

Of their constituent parts some are common to both, some peculiar to Tragedy: whoever, therefore knows what is good or bad Tragedy, knows also about Epic poetry. All the elements of an Epic poem are found in Tragedy, but the elements of a Tragedy are not all found in the Epic poem.

6

Of the poetry which imitates in hexameter verse, and of Comedy, we will speak hereafter. Let us now discuss Tragedy, resuming its formal definition, as resulting from what has been already said.

Tragedy, then, is an imitation of an action that is serious, complete, and of a certain magnitude; in language embellished with each kind of artistic ornament, the several kinds being found in separate parts of the play; in the form of action, not of narrative; through pity and fear effecting the proper purgation of these emotions. By ‘language embellished,’ I mean language into which rhythm, ‘harmony’ and song enter. By ‘the several

kinds in separate parts,' I mean, that some parts are rendered through the medium of verse alone, others again with the aid of song.

Now as tragic imitation implies persons acting, it necessarily follows in the first place, that Spectacular equipment will be a part of Tragedy. Next, Song and Diction, for these are the media of imitation. By 'Diction' I mean the mere metrical arrangement of the words: as for 'Song,' it is a term whose sense every one understands.

Again, Tragedy is the imitation of an action; and an action implies personal agents, who necessarily possess certain distinctive qualities both of character and thought; for it is by these that we qualify actions themselves, and these – thought and character – are the two natural causes from which actions spring, and on actions again all success or failure depends. Hence, the Plot is the imitation of the action – for by plot I here mean the arrangement of the incidents. By Character I mean that in virtue of which we ascribe certain qualities to the agents. Thought is required wherever a statement is proved, or, it may be, a general truth enunciated. Every Tragedy, therefore, must have six parts, which parts determine its quality – namely, Plot, Character, Diction, Thought, Spectacle, Song. Two of the parts constitute the medium of imitation, one the manner, and three the objects of imitation. And these complete the fist. These elements have been employed, we may say, by the poets to a man; in fact, every play contains Spectacular elements as well as Character, Plot, Diction, Song, and Thought.

But most important of all is the structure of the incidents. For Tragedy is an imitation, not of men, but of an action and of life, and life consists in action, and its end is a mode of action, not a quality. Now character determines men's qualities, but it is by their actions that they are happy or the reverse. Dramatic

action, therefore, is not with a view to the representation of character: character comes in as subsidiary to the actions. Hence the incidents and the plot are the end of a tragedy; and the end is the chief thing of all. Again, without action there cannot be a tragedy; there may be without character. The tragedies of most of our modern poets fail in the rendering of character; and of poets in general this is often true. It is the same in painting; and here lies the difference between Zeuxis and Polygnotus. Polygnotus delineates character well; the style of Zeuxis is devoid of ethical quality. Again, if you string together a set of speeches expressive of character, and well finished in point of diction and thought, you will not produce the essential tragic effect nearly so well as with a play which, however deficient in these respects, yet has a plot and artistically constructed incidents. Besides which, the most powerful elements of emotional interest in Tragedy – Peripeteia or Reversal of the Situation, and Recognition scenes – are parts of the plot. A further proof is, that novices in the art attain to finish of diction and precision of portraiture before they can construct the plot. It is the same with almost all the early poets.

The plot, then, is the first principle, and, as it were, the soul of a tragedy; Character holds the second place. A similar fact is seen in painting. The most beautiful colors, laid on confusedly, will not give as much pleasure as the chalk outline of a portrait. Thus Tragedy is the imitation of an action, and of the agents mainly with a view to the action.

Third in order is Thought – that is, the faculty of saying what is possible and pertinent in given circumstances. In the case of oratory, this is the function of the political art and of the art of rhetoric: and so indeed the older poets make their characters speak the language of civic life; the poets of our time, the language of the rhetoricians. Character is that which reveals moral purpose, showing what kind of things a man chooses or

avoids. Speeches, therefore, which do not make this manifest, or in which the speaker does not choose or avoid anything whatever, are not expressive of character. Thought, on the other hand, is found where something is proved to be or not to be, or a general maxim is enunciated.

Fourth among the elements enumerated comes Diction; by which I mean, as has been already said, the expression of the meaning in words; and its essence is the same both in verse and prose.

Of the remaining elements Song holds the chief place among the embellishments

The Spectacle has, indeed, an emotional attraction of its own, but, of all the parts, it is the least artistic, and connected least with the art of poetry. For the power of Tragedy, we may be sure, is felt even apart from representation and actors. Besides, the production of spectacular effects depends more on the art of the stage machinist than on that of the poet.

7

These principles being established, let us now discuss the proper structure of the Plot, since this is the first and most important thing in Tragedy.

Now, according to our definition Tragedy is an imitation of an action that is complete, and whole, and of a certain magnitude; for there may be a whole that is wanting in magnitude. A whole is that which has a beginning, a middle, and an end. A beginning is that which does not itself follow anything by causal necessity, but after which something naturally is or comes to be.

An end, on the contrary, is that which itself naturally follows some other thing, either by necessity, or as a rule, but has nothing following it. A middle is that which follows something as some other thing follows it. A well constructed plot, therefore, must neither begin nor end at haphazard, but conform to these principles.

Again, a beautiful object, whether it be a living organism or any whole composed of parts, must not only have an orderly arrangement of parts, but must also be of a certain magnitude; for beauty depends on magnitude and order. Hence a very small animal organism cannot be beautiful; for the view of it is confused, the object being seen in an almost imperceptible moment of time. Nor, again, can one of vast size be beautiful; for as the eye cannot take it all in at once, the unity and sense of the whole is lost for the spectator; as for instance if there were one a thousand miles long. As, therefore, in the case of animate bodies and organisms a certain magnitude is necessary, and a magnitude which may be easily embraced in one view; so in the plot, a certain length is necessary, and a length which can be easily embraced by the memory. The limit of length in relation to dramatic competition and sensuous presentment is no part of artistic theory. For had it been the rule for a hundred tragedies to compete together, the performance would have been regulated by the water-clock – as indeed we are told was formerly done. But the limit as fixed by the nature of the drama itself is this: the greater the length, the more beautiful will the piece be by reason of its size, provided that the whole be perspicuous. And to define the matter roughly, we may say that the proper magnitude is comprised within such limits, that the sequence of events, according to the law of probability or necessity, will admit of a change from bad fortune to good, or from good fortune to bad.

8

Unity of plot does not, as some persons think, consist in the unity of the hero. For infinitely various are the incidents in one man's life which cannot be reduced to unity; and so, too, there are many actions of one man out of which we cannot make one action. Hence the error, as it appears, of all poets who have composed a Heracleid, a Theseid, or other poems of the kind. They imagine that as Heracles was one man, the story of Heracles must also be a unity. But Homer, as in all else he is of surpassing merit, here too – whether from art or natural genius – seems to have happily discerned the truth. In composing the Odyssey he did not include all the adventures of Odysseus – such as his wound on Parnassus, or his feigned madness at the mustering of the host – incidents between which there was no necessary or probable connection: but he made the Odyssey, and likewise the Iliad, to center round an action that in our sense of the word is one. As therefore, in the other imitative arts, the imitation is one when the object imitated is one, so the plot, being an imitation of an action, must imitate one action and that a whole, the structural union of the parts being such that, if any one of them is displaced or removed, the whole will be disjointed and disturbed. For a thing whose presence or absence makes no visible difference, is not an organic part of the whole.

9

It is, moreover, evident from what has been said, that it is not the function of the poet to relate what has happened, but what may happen – what is possible according to the law of

probability or necessity. The poet and the historian differ not by writing in verse or in prose. The work of Herodotus might be put into verse, and it would still be a species of history, with meter no less than without it. The true difference is that one relates what has happened, the other what may happen. Poetry, therefore, is a more philosophical and a higher thing than history: for poetry tends to express the universal, history the particular. By the universal I mean how a person of a certain type on occasion speak or act, according to the law of probability or necessity; and it is this universality at which poetry aims in the names she attaches to the personages. The particular is – for example – what Alcibiades did or suffered. In Comedy this is already apparent: for here the poet first constructs the plot on the lines of probability, and then inserts characteristic names – unlike the lampooners who write about particular individuals. But tragedians still keep to real names, the reason being that what is possible is credible: what has not happened we do not at once feel sure to be possible; but what has happened is manifestly possible: otherwise it would not have happened. Still there are even some tragedies in which there are only one or two well-known names, the rest being fictitious. In others, none are well known – as in Agathon's Antheus, where incidents and names alike are fictitious, and yet they give none the less pleasure. We must not, therefore, at all costs keep to the received legends, which are the usual subjects of Tragedy. Indeed, it would be absurd to attempt it; for even subjects that are known are known only to a few, and yet give pleasure to all. It clearly follows that the poet or 'maker' should be the maker of plots rather than of verses; since he is a poet because he imitates, and what he imitates are actions. And even if he chances to take a historical subject, he is none the less a poet; for there is no reason why some events that have actually happened should not conform to the law of the probable and

possible, and in virtue of that quality in them he is their poet or maker.

Of all plots and actions the episodic are the worst. I call a plot 'episodic' in which the episodes or acts succeed one another without probable or necessary sequence. Bad poets compose such pieces by their own fault, good poets, to please the players; for, as they write show pieces for competition, they stretch the plot beyond its capacity, and are often forced to break the natural continuity.

But again, Tragedy is an imitation not only of a complete action, but of events inspiring fear or pity. Such an effect is best produced when the events come on us by surprise; and the effect is heightened when, at the same time, they follows as cause and effect. The tragic wonder will then be greater than if they happened of themselves or by accident; for even coincidences are most striking when they have an air of design. We may instance the statue of Mitys at Argos, which fell upon his murderer while he was a spectator at a festival, and killed him. Such events seem not to be due to mere chance. Plots, therefore, constructed on these principles are necessarily the best.

10

Plots are either Simple or Complex, for the actions in real life, of which the plots are an imitation, obviously show a similar distinction. An action which is one and continuous in the sense above defined, I call Simple, when the change of fortune takes place without Reversal of the Situation and without Recognition

A Complex action is one in which the change is accompanied by such Reversal, or by Recognition, or by both. These last should arise from the internal structure of the plot, so that what follows should be the necessary or probable result of the preceding action. It makes all the difference whether any given event is a case of propter hoc or post hoc.

11

Reversal of the Situation is a change by which the action veers round to its opposite, subject always to our rule of probability or necessity. Thus in the Oedipus, the messenger comes to cheer Oedipus and free him from his alarms about his mother, but by revealing who he is, he produces the opposite effect. Again in the Lynceus, Lynceus is being led away to his death, and Danaus goes with him, meaning to slay him; but the outcome of the preceding incidents is that Danaus is killed and Lynceus saved.

Recognition, as the name indicates, is a change from ignorance to knowledge, producing love or hate between the persons destined by the poet for good or bad fortune. The best form of recognition is coincident with a Reversal of the Situation, as in the Oedipus. There are indeed other forms. Even inanimate things of the most trivial kind may in a sense be objects of recognition. Again, we may recognize or discover whether a person has done a thing or not. But the recognition which is most intimately connected with the plot and action is, as we have said, the recognition of persons. This recognition, combined with Reversal, will produce either pity or fear; and actions producing these effects are those which, by our definition, Tragedy represents. Moreover, it is upon such situations that the issues of good or bad fortune will depend.

Recognition, then, being between persons, it may happen that one person only is recognized by the other – when the latter is already known – or it may be necessary that the recognition should be on both sides. Thus Iphigenia is revealed to Orestes by the sending of the letter; but another act of recognition is required to make Orestes known to Iphigenia.

Two parts, then, of the Plot – Reversal of the Situation and Recognition – turn upon surprises. A third part is the Scene of Suffering. The Scene of Suffering is a destructive or painful action, such as death on the stage, bodily agony, wounds, and the like.

12

The parts of Tragedy which must be treated as elements of the whole have been already mentioned. We now come to the quantitative parts – the separate parts into which Tragedy is divided – namely, Prologue, Episode, Exode, Choric song; this last being divided into Parode and Stasimon. These are common to all plays: peculiar to some are the songs of actors from the stage and the Commoi.

The Prologue is that entire part of a tragedy which precedes the Parode of the Chorus. The Episode is that entire part of a tragedy which is between complete choric songs. The Exode is that entire part of a tragedy which has no choric song after it. Of the Choric part the Parode is the first undivided utterance of the Chorus: the Stasimon is a Choric ode without anapaests or trochaic tetrameters: the Commos is a joint lamentation of Chorus and actors. The parts of Tragedy which must be treated as elements of the whole have been already mentioned. The

quantitative parts – the separate parts into which it is divided – are here enumerated.

13

As the sequel to what has already been said, we must proceed to consider what the poet should aim at, and what he should avoid, in constructing his plots; and by what means the specific effect of Tragedy will be produced.

A perfect tragedy should, as we have seen, be arranged not on the simple but on the complex plan. It should, moreover, imitate actions which excite pity and fear, this being the distinctive mark of tragic imitation. It follows plainly, in the first place, that the change of fortune presented must not be the spectacle of a virtuous man brought from prosperity to adversity: for this moves neither pity nor fear; it merely shocks us. Nor, again, that of a bad man passing from adversity to prosperity: for nothing can be more alien to the spirit of Tragedy; it possesses no single tragic quality; it neither satisfies the moral sense nor calls forth pity or fear. Nor, again, should the downfall of the utter villain be exhibited. A plot of this kind would, doubtless, satisfy the moral sense, but it would inspire neither pity nor fear; for pity is aroused by unmerited misfortune, fear by the misfortune of a man like ourselves. Such an event, therefore, will be neither pitiful nor terrible. There remains, then, the character between these two extremes – that of a man who is not eminently good and just, yet whose misfortune is brought about not by vice or depravity, but by some error or frailty. He must be one who is highly renowned and prosperous – a personage like Oedipus, Thyestes, or other illustrious men of such families.

A well-constructed plot should, therefore, be single in its issue, rather than double as some maintain. The change of fortune should be not from bad to good, but, reversely, from good to bad. It should come about as the result not of vice, but of some great error or frailty, in a character either such as we have described, or better rather than worse. The practice of the stage bears out our view. At first the poets recounted any legend that came in their way. Now, the best tragedies are founded on the story of a few houses – on the fortunes of Alcmaeon, Oedipus, Orestes, Meleager, Thyestes, Telephus, and those others who have done or suffered something terrible. A tragedy, then, to be perfect according to the rules of art should be of this construction. Hence they are in error who censure Euripides just because he follows this principle in his plays, many of which end unhappily. It is, as we have said, the right ending. The best proof is that on the stage and in dramatic competition, such plays, if well worked out, are the most tragic in effect; and Euripides, faulty though he may be in the general management of his subject, yet is felt to be the most tragic of the poets.

In the second rank comes the kind of tragedy which some place first. Like the Odyssey, it has a double thread of plot, and also an opposite catastrophe for the good and for the bad. It is accounted the best because of the weakness of the spectators; for the poet is guided in what he writes by the wishes of his audience. The pleasure, however, thence derived is not the true tragic pleasure. It is proper rather to Comedy, where those who, in the piece, are the deadliest enemies – like Orestes and Aegisthus – quit the stage as friends at the close, and no one slays or is slain.

14

Fear and pity may be aroused by spectacular means; but they may also result from the inner structure of the piece, which is the better way, and indicates a superior poet. For the plot ought to be so constructed that, even without the aid of the eye, he who hears the tale told will thrill with horror and melt to pity at what takes Place. This is the impression we should receive from hearing the story of the Oedipus. But to produce this effect by the mere spectacle is a less artistic method, and dependent on extraneous aids. Those who employ spectacular means to create a sense not of the terrible but only of the monstrous, are strangers to the purpose of Tragedy; for we must not demand of Tragedy any and every kind of pleasure, but only that which is proper to it. And since the pleasure which the poet should afford is that which comes from pity and fear through imitation, it is evident that this quality must be impressed upon the incidents.

Let us then determine what are the circumstances which strike us as terrible or pitiful.

Actions capable of this effect must happen between persons who are either friends or enemies or indifferent to one another. If an enemy kills an enemy, there is nothing to excite pity either in the act or the intention – except so far as the suffering in itself is pitiful. So again with indifferent persons. But when the tragic incident occurs between those who are near or dear to one another – if, for example, a brother kills, or intends to kill, a brother, a son his father, a mother her son, a son his mother, or any other deed of the kind is done – these are the situations to be looked for by the poet. He may not indeed destroy the framework of the received legends – the fact, for instance, that Clytemnestra was slain by Orestes and Eriphyle by Alcmaeon – but he ought to show of his own, and skilfully handle the

traditional. material. Let us explain more clearly what is meant by skilful handling.

The action may be done consciously and with knowledge of the persons, in the manner of the older poets. It is thus too that Euripides makes Medea slay her children. Or, again, the deed of horror may be done, but done in ignorance, and the tie of kinship or friendship be discovered afterwards. The Oedipus of Sophocles is an example. Here, indeed, the incident is outside the drama proper; but cases occur where it falls within the action of the play: one may cite the Alcmaeon of Astydamas, or Telegonus in the Wounded Odysseus. Again, there is a third case – [to be about to act with knowledge of the persons and then not to act. The fourth case] is when some one is about to do an irreparable deed through ignorance, and makes the discovery before it is done. These are the only possible ways. For the deed must either be done or not done – and that wittingly or unwittingly. But of all these ways, to be about to act knowing the persons, and then not to act, is the worst. It is shocking without being tragic, for no disaster follows It is, therefore, never, or very rarely, found in poetry. One instance, however, is in the Antigone, where Haemon threatens to kill Creon. The next and better way is that the deed should be perpetrated. Still better, that it should be perpetrated in ignorance, and the discovery made afterwards. There is then nothing to shock us, while the discovery produces a startling effect. The last case is the best, as when in the Cresphontes Merope is about to slay her son, but, recognizing who he is, spares his life. So in the Iphigenia, the sister recognizes the brother just in time. Again in the Helle, the son recognizes the mother when on the point of giving her up. This, then, is why a few families only, as has been already observed, furnish the subjects of tragedy. It was not art, but happy chance, that led the poets in search of subjects to impress the tragic quality upon their plots. They are compelled,

therefore, to have recourse to those houses whose history contains moving incidents like these.

Enough has now been said concerning the structure of the incidents, and the right kind of plot.

15

In respect of Character there are four things to be aimed at. First, and most important, it must be good. Now any speech or action that manifests moral purpose of any kind will be expressive of character: the character will be good if the purpose is good. This rule is relative to each class. Even a woman may be good, and also a slave; though the woman may be said to be an inferior being, and the slave quite worthless. The second thing to aim at is propriety. There is a type of manly valor; but valor in a woman, or unscrupulous cleverness is inappropriate. Thirdly, character must be true to life: for this is a distinct thing from goodness and propriety, as here described. The fourth point is consistency: for though the subject of the imitation, who suggested the type, be inconsistent, still he must be consistently inconsistent. As an example of motiveless degradation of character, we have Menelaus in the Orestes; of character indecorous and inappropriate, the lament of Odysseus in the Scylla, and the speech of Melanippe; of inconsistency, the Iphigenia at Aulis – for Iphigenia the suppliant in no way resembles her later self.

As in the structure of the plot, so too in the portraiture of character, the poet should always aim either at the necessary or the probable. Thus a person of a given character should speak or act in a given way, by the rule either of necessity or of probability; just as this event should follow that by necessary or

probable sequence. It is therefore evident that the unraveling of the plot, no less than the complication, must arise out of the plot itself, it must not be brought about by the Deus ex Machina – as in the Medea, or in the return of the Greeks in the Iliad. The Deus ex Machina should be employed only for events external to the drama – for antecedent or subsequent events, which lie beyond the range of human knowledge, and which require to be reported or foretold; for to the gods we ascribe the power of seeing all things. Within the action there must be nothing irrational. If the irrational cannot be excluded, it should be outside the scope of the tragedy. Such is the irrational element the Oedipus of Sophocles.

Again, since Tragedy is an imitation of persons who are above the common level, the example of good portrait painters should be followed. They, while reproducing the distinctive form of the original, make a likeness which is true to life and yet more beautiful. So too the poet, in representing men who are irascible or indolent, or have other defects of character, should preserve the type and yet ennoble it. In this way Achilles is portrayed by Agathon and Homer.

These then are rules the poet should observe. Nor should he neglect those appeals to the senses, which, though not among the essentials, are the concomitants of poetry; for here too there is much room for error. But of this enough has been said in our published treatises.

16

What Recognition is has been already explained. We will now enumerate its kinds.

First, the least artistic form, which, from poverty of wit, is most commonly employed – recognition by signs. Of these some are congenital – such as 'the spear which the earth-born race bear on their bodies,' or the stars introduced by Carcinus in his Thyestes. Others are acquired after birth; and of these some are bodily marks, as scars; some external tokens, as necklaces, or the little ark in the Tyro by which the discovery is effected. Even these admit of more or less skilful treatment. Thus in the recognition of Odysseus by his scar, the discovery is made in one way by the nurse, in another by the swineherds. The use of tokens for the express purpose of proof – and, indeed, any formal proof with or without tokens – is a less artistic mode of recognition. A better kind is that which comes about by a turn of incident, as in the Bath Scene in the Odyssey.

Next come the recognitions invented at will by the poet, and on that account wanting in art. For example, Orestes in the Iphigenia reveals the fact that he is Orestes. She, indeed, makes herself known by the letter; but he, by speaking himself, and saying what the poet, not what the plot requires. This, therefore, is nearly allied to the fault above mentioned – for Orestes might as well have brought tokens with him. Another similar instance is the 'voice of the shuttle' in the Tereus of Sophocles.

The third kind depends on memory when the sight of some object awakens a feeling: as in the Cyprians of Dicaeogenes, where the hero breaks into tears on seeing the picture; or again in the Lay of Alcinous, where Odysseus, hearing the minstrel play the lyre, recalls the past and weeps; and hence the recognition.

The fourth kind is by process of reasoning. Thus in the Choephori: 'Some one resembling me has come: no one resembles me but Orestes: therefore Orestes has come.' Such too is the discovery made by Iphigenia in the play of Polyidus

the Sophist. It was a natural reflection for Orestes to make, 'So I too must die at the altar like my sister.' So, again, in the Tydeus of Theodectes, the father says, 'I came to find my son, and I lose my own life.' So too in the Phineidae: the women, on seeing the place, inferred their fate – 'Here we are doomed to die, for here we were cast forth.' Again, there is a composite kind of recognition involving false inference on the part of one of the characters, as in the Odysseus Disguised as a Messenger. A said [that no one else was able to bend the bow; .. hence B (the disguised Odysseus) imagined that A would] recognize the bow which, in fact, he had not seen; and to bring about a recognition by this means – the expectation that A would recognize the bow – is false inference.

But, of all recognitions, the best is that which arises from the incidents themselves, where the startling discovery is made by natural means. Such is that in the Oedipus of Sophocles, and in the Iphigenia; for it was natural that Iphigenia should wish to dispatch a letter. These recognitions alone dispense with the artificial aid of tokens or amulets. Next come the recognitions by process of reasoning.

17

In constructing the plot and working it out with the proper diction, the poet should place the scene, as far as possible, before his eyes. In this way, seeing everything with the utmost vividness, as if he were a spectator of the action, he will discover what is in keeping with it, and be most unlikely to overlook inconsistencies. The need of such a rule is shown by the fault found in Carcinus. Amphiaraus was on his way from the temple. This fact escaped the observation of one who did

not see the situation. On the stage, however, the Piece failed, the audience being offended at the oversight.

Again, the poet should work out his play, to the best of his power, with appropriate gestures; for those who feel emotion are most convincing through natural sympathy with the characters they represent; and one who is agitated storms, one who is angry rages, with the most lifelike reality. Hence poetry implies either a happy gift of nature or a strain of madness. In the one case a man can take the mould of any character; in the other, he is lifted out of his proper self.

As for the story, whether the poet takes it ready made or constructs it for himself, he should first sketch its general outline, and then fill in the episodes and amplify in detail. The general plan may be illustrated by the Iphigenia. A young girl is sacrificed; she disappears mysteriously from the eyes of those who sacrificed her; she is transported to another country, where the custom is to offer up an strangers to the goddess. To this ministry she is appointed. Some time later her own brother chances to arrive. The fact that the oracle for some reason ordered him to go there, is outside the general plan of the play. The purpose, again, of his coming is outside the action proper. However, he comes, he is seized, and, when on the point of being sacrificed, reveals who he is. The mode of recognition may be either that of Euripides or of Polyidus, in whose play he exclaims very naturally: 'So it was not my sister only, but I too, who was doomed to be sacrificed'; and by that remark he is saved.

After this, the names being once given, it remains to fill in the episodes. We must see that they are relevant to the action. In the case of Orestes, for example, there is the madness which led to his capture, and his deliverance by means of the purificatory rite. In the drama, the episodes are short, but it is these that

give extension to Epic poetry. Thus the story of the Odyssey can be stated briefly. A certain man is absent from home for many years; he is jealously watched by Poseidon, and left desolate. Meanwhile his home is in a wretched plight – suitors are wasting his substance and plotting against his son. At length, tempest-tost, he himself arrives; he makes certain persons acquainted with him; he attacks the suitors with his own hand, and is himself preserved while he destroys them. This is the essence of the plot; the rest is episode.

18

Every tragedy falls into two parts – Complication and Unraveling or Denouement. Incidents extraneous to the action are frequently combined with a portion of the action proper, to form the Complication; the rest is the Unraveling. By the Complication I mean all that extends from the beginning of the action to the part which marks the turning-point to good or bad fortune. The Unraveling is that which extends from the beginning of the change to the end. Thus, in the Lynceus of Theodectes, the Complication consists of the incidents presupposed in the drama, the seizure of the child, and then again .. [the Unraveling] extends from the accusation of murder to the end.

There are four kinds of Tragedy: the Complex, depending entirely on Reversal of the Situation and Recognition; the Pathetic (where the motive is passion) – such as the tragedies on Ajax and Ixion; the Ethical (where the motives are ethical) – such as the Phthiotides and the Peleus. The fourth kind is the Simple. [We here exclude the purely spectacular element], exemplified by the Phorcides, the Prometheus, and scenes laid

in Hades. The poet should endeavor, if possible, to combine all poetic elements; or failing that, the greatest number and those the most important; the more so, in face of the caviling criticism of the day. For whereas there have hitherto been good poets, each in his own branch, the critics now expect one man to surpass all others in their several lines of excellence.

In speaking of a tragedy as the same or different, the best test to take is the plot. Identity exists where the Complication and Unraveling are the same. Many poets tie the knot well, but unravel it Both arts, however, should always be mastered.

Again, the poet should remember what has been often said, and not make an Epic structure into a tragedy – by an Epic structure I mean one with a multiplicity of plots – as if, for instance, you were to make a tragedy out of the entire story of the Iliad. In the Epic poem, owing to its length, each part assumes its proper magnitude. In the drama the result is far from answering to the poet's expectation. The proof is that the poets who have dramatized the whole story of the Fall of Troy, instead of selecting portions, like Euripides; or who have taken the whole tale of Niobe, and not a part of her story, like Aeschylus, either fail utterly or meet with poor success on the stage. Even Agathon has been known to fail from this one defect. In his Reversals of the Situation, however, he shows a marvelous skill in the effort to hit the popular taste – to produce a tragic effect that satisfies the moral sense. This effect is produced when the clever rogue, like Sisyphus, is outwitted, or the brave villain defeated. Such an event is probable in Agathon's sense of the word: 'is probable,' he says, 'that many things should happen contrary to probability.'

The Chorus too should be regarded as one of the actors; it should be an integral part of the whole, and share in the action, in the manner not of Euripides but of Sophocles. As for the later

poets, their choral songs pertain as little to the subject of the piece as to that of any other tragedy. They are, therefore, sung as mere interludes – a practice first begun by Agathon. Yet what difference is there between introducing such choral interludes, and transferring a speech, or even a whole act, from one play to another.

19

It remains to speak of Diction and Thought, the other parts of Tragedy having been already discussed. concerning Thought, we may assume what is said in the Rhetoric, to which inquiry the subject more strictly belongs. Under Thought is included every effect which has to be produced by speech, the subdivisions being: proof and refutation; the excitation of the feelings, such as pity, fear, anger, and the like; the suggestion of importance or its opposite. Now, it is evident that the dramatic incidents must be treated from the same points of view as the dramatic speeches, when the object is to evoke the sense of pity, fear, importance, or probability. The only difference is that the incidents should speak for themselves without verbal exposition; while effects aimed at in should be produced by the speaker, and as a result of the speech. For what were the business of a speaker, if the Thought were revealed quite apart from what he says?

Next, as regards Diction. One branch of the inquiry treats of the Modes of Utterance. But this province of knowledge belongs to the art of Delivery and to the masters of that science. It includes, for instance – what is a command, a prayer, a statement, a threat, a question, an answer, and so forth. To know or not to know these things involves no serious censure

upon the poet's art. For who can admit the fault imputed to Homer by Protagoras – that in the words, 'Sing, goddess, of the wrath, he gives a command under the idea that he utters a prayer? For to tell some one to do a thing or not to do it is, he says, a command. We may, therefore, pass this over as an inquiry that belongs to another art, not to poetry.

20

Language in general includes the following parts: Letter, Syllable, Connecting Word, Noun, Verb, Inflection or Case, Sentence or Phrase.

A Letter is an indivisible sound, yet not every such sound, but only one which can form part of a group of sounds. For even brutes utter indivisible sounds, none of which I call a letter. The sound I mean may be either a vowel, a semivowel, or a mute. A vowel is that which without impact of tongue or lip has an audible sound. A semivowel that which with such impact has an audible sound, as S and R. A mute, that which with such impact has by itself no sound, but joined to a vowel sound becomes audible, as G and D. These are distinguished according to the form assumed by the mouth and the place where they are produced; according as they are aspirated or smooth, long or short; as they are acute, grave, or of an intermediate tone; which inquiry belongs in detail to the writers on meter.

A Syllable is a nonsignificant sound, composed of a mute and a vowel: for GR without A is a syllable, as also with A – GRA. But the investigation of these differences belongs also to metrical science.

A Connecting Word is a nonsignificant sound, which neither causes nor hinders the union of many sounds into one significant sound; it may be placed at either end or in the middle of a sentence. Or, a nonsignificant sound, which out of several sounds, each of them significant, is capable of forming one significant sound – as amphi, peri, and the like. Or, a nonsignificant sound, which marks the beginning, end, or division of a sentence; such, however, that it cannot correctly stand by itself at the beginning of a sentence – as men, etoi, de.

A Noun is a composite significant sound, not marking time, of which no part is in itself significant: for in double or compound words we do not employ the separate parts as if each were in itself significant. Thus in Theodorus, 'god-given,' the doron or 'gift' is not in itself significant.

A Verb is a composite significant sound, marking time, in which, as in the noun, no part is in itself significant. For 'man' or 'white' does not express the idea of 'when'; but 'he walks' or 'he has walked' does connote time, present or past.

Inflection belongs both to the noun and verb, and expresses either the relation 'of,' 'to,' or the like; or that of number, whether one or many, as 'man' or 'men'; or the modes or tones in actual delivery, e.g., a question or a command. 'Did he go?' and 'go' are verbal inflections of this kind.

A Sentence or Phrase is a composite significant sound, some at least of whose parts are in themselves significant; for not every such group of words consists of verbs and nouns – 'the definition of man,' for example – but it may dispense even with the verb. Still it will always have some significant part, as 'in walking,' or 'Cleon son of Cleon.' A sentence or phrase may form a unity in two ways – either as signifying one thing, or as consisting of several parts linked together. Thus the Iliad is one

by the linking together of parts, the definition of man by the unity of the thing signified.

21

Words are of two kinds, simple and double. By simple I mean those composed of nonsignificant elements, such as ge, ‘earth.’ By double or compound, those composed either of a significant and nonsignificant element (though within the whole word no element is significant), or of elements that are both significant. A word may likewise be triple, quadruple, or multiple in form, like so many Massilian expressions, e.g., ‘Hermo-caico-xanthus [who prayed to Father Zeus].’

Every word is either current, or strange, or metaphorical, or ornamental, or newly-coined, or lengthened, or contracted, or altered.

By a current or proper word I mean one which is in general use among a people; by a strange word, one which is in use in another country. Plainly, therefore, the same word may be at once strange and current, but not in relation to the same people. The word sigynon, ‘lance,’ is to the Cyprians a current term but to us a strange one.

Metaphor is the application of an alien name by transference either from genus to species, or from species to genus, or from species to species, or by analogy, that is, proportion. Thus from genus to species, as: ‘There lies my ship’; for lying at anchor is a species of lying. From species to genus, as: ‘Verily ten thousand noble deeds hath Odysseus wrought’; for ten thousand is a species of large number, and is here used for a large number generally. From species to species, as: ‘With blade of bronze

drew away the life,' and 'Cleft the water with the vessel of unyielding bronze.' Here arusai, 'to draw away' is used for tamein, 'to cleave,' and tamein, again for arusai – each being a species of taking away. Analogy or proportion is when the second term is to the first as the fourth to the third. We may then use the fourth for the second, or the second for the fourth. Sometimes too we qualify the metaphor by adding the term to which the proper word is relative. Thus the cup is to Dionysus as the shield to Ares. The cup may, therefore, be called 'the shield of Dionysus,' and the shield 'the cup of Ares.' Or, again, as old age is to life, so is evening to day. Evening may therefore be called, 'the old age of the day,' and old age, 'the evening of life,' or, in the phrase of Empedocles, 'life's setting sun.' For some of the terms of the proportion there is at times no word in existence; still the metaphor may be used. For instance, to scatter seed is called sowing: but the action of the sun in scattering his rays is nameless. Still this process bears to the sun the same relation as sowing to the seed. Hence the expression of the poet 'sowing the god-created light.' There is another way in which this kind of metaphor may be employed. We may apply an alien term, and then deny of that term one of its proper attributes; as if we were to call the shield, not 'the cup of Ares,' but 'the wineless cup'.

A newly-coined word is one which has never been even in local use, but is adopted by the poet himself. Some such words there appear to be: as ernyges, 'sprouters,' for kerata, 'horns'; and areter, 'supplicator', for hiereus, 'priest.'

A word is lengthened when its own vowel is exchanged for a longer one, or when a syllable is inserted. A word is contracted when some part of it is removed. Instances of lengthening are: poleos for poleos, Peleiadeo for Peleidou; of contraction: kri, do, and ops, as in mia ginetai amphoteron ops, 'the appearance of both is one.'

An altered word is one in which part of the ordinary form is left unchanged, and part is recast: as in dexiteron kata mazon, ‘on the right breast,’ dexiteron is for dexion.

Nouns in themselves are either masculine, feminine, or neuter. Masculine are such as end in N, R, S, or in some letter compounded with S – these being two, PS and X. Feminine, such as end in vowels that are always long, namely E and O, and – of vowels that admit of lengthening – those in A. Thus the number of letters in which nouns masculine and feminine end is the same; for PS and X are equivalent to endings in S. No noun ends in a mute or a vowel short by nature. Three only end in I – meli, ‘honey’; kommi, ‘gum’; peperi, ‘pepper’; five end in U. Neuter nouns end in these two latter vowels; also in N and S.

22

The perfection of style is to be clear without being mean. The clearest style is that which uses only current or proper words; at the same time it is mean – witness the poetry of Cleophon and of Sthenelus. That diction, on the other hand, is lofty and raised above the commonplace which employs unusual words. By unusual, I mean strange (or rare) words, metaphorical, lengthened – anything, in short, that differs from the normal idiom. Yet a style wholly composed of such words is either a riddle or a jargon; a riddle, if it consists of metaphors; a jargon, if it consists of strange (or rare) words. For the essence of a riddle is to express true facts under impossible combinations. Now this cannot be done by any arrangement of ordinary words, but by the use of metaphor it can. Such is the riddle: ‘A man I saw who on another man had glued the bronze by aid of fire,’ and others of the same kind. A diction that is made up of

strange (or rare) terms is a jargon. A certain infusion, therefore, of these elements is necessary to style; for the strange (or rare) word, the metaphorical, the ornamental, and the other kinds above mentioned, will raise it above the commonplace and mean, while the use of proper words will make it perspicuous. But nothing contributes more to produce a cleanness of diction that is remote from commonness than the lengthening, contraction, and alteration of words. For by deviating in exceptional cases from the normal idiom, the language will gain distinction; while, at the same time, the partial conformity with usage will give perspicuity. The critics, therefore, are in error who censure these licenses of speech, and hold the author up to ridicule. Thus Eucleides, the elder, declared that it would be an easy matter to be a poet if you might lengthen syllables at will. He caricatured the practice in the very form of his diction, as in the verse:

Epicharen eidon Marathonade badizonta,

I saw Epichares walking to Marathon, or,

ouk an g'eramenos ton ekeinou elleboron.

Not if you desire his hellebore.

To employ such license at all obtrusively is, no doubt, grotesque; but in any mode of poetic diction there must be moderation. Even metaphors, strange (or rare) words, or any similar forms of speech, would produce the like effect if used without propriety and with the express purpose of being ludicrous. How great a difference is made by the appropriate use of lengthening, may be seen in Epic poetry by the insertion of ordinary forms in the verse. So, again, if we take a strange (or rare) word, a metaphor, or any similar mode of expression, and replace it by the current or proper term, the truth of our observation will be manifest. For example, Aeschylus and Euripides each composed the same

iambic line. But the alteration of a single word by Euripides, who employed the rarer term instead of the ordinary one, makes one verse appear beautiful and the other trivial. Aeschylus in his Philoctetes says:

Phagedaina d'he mou sarkas esthiei podos.

The tumor which is eating the flesh of my foot.

Euripides substitutes thoinatai, 'feasts on,' for esthiei, 'feeds on.' Again, in the line,

nun de m'eon oligos te kai outidanos kai aeikes,

Yet a small man, worthless and unseemly,

the difference will be felt if we substitute the common words,

nun de m'eon mikros te kai asthenikos kai aeides.

Yet a little fellow, weak and ugly. Or, if for the line,

diphron aeikelion katatheis oligen te trapezan,

Setting an unseemly couch and a meager table,

we read,

diphron mochtheron katatheis mikran te trapezan.

Setting a wretched couch and a puny table.

Or, for eiones booosin, 'the sea shores roar,' eiones krazousin, 'the sea shores screech.'

Again, Ariphrades ridiculed the tragedians for using phrases which no one would employ in ordinary speech: for example, domaton apo, 'from the house away,' instead of apo domaton, 'away from the house;' sethen, ego de nin, 'to thee, and I to him;' Achilleos peri, 'Achilles about,' instead of peri Achilleos,

'about Achilles;' and the like. It is precisely because such phrases are not part of the current idiom that they give distinction to the style. This, however, he failed to see.

It is a great matter to observe propriety in these several modes of expression, as also in compound words, strange (or rare) words, and so forth. But the greatest thing by far is to have a command of metaphor. This alone cannot be imparted by another; it is the mark of genius, for to make good metaphors implies an eye for resemblances.

Of the various kinds of words, the compound are best adapted to dithyrambs, rare words to heroic poetry, metaphors to iambic. In heroic poetry, indeed, all these varieties are serviceable. But in iambic verse, which reproduces, as far as may be, familiar speech, the most appropriate words are those which are found even in prose. These are the current or proper, the metaphorical, the ornamental.

Concerning Tragedy and imitation by means of action this may suffice.

23

As to that poetic imitation which is narrative in form and employs a single meter, the plot manifestly ought, as in a tragedy, to be constructed on dramatic principles. It should have for its subject a single action, whole and complete, with a beginning, a middle, and an end. It will thus resemble a living organism in all its unity, and produce the pleasure proper to it. It will differ in structure from historical compositions, which of necessity present not a single action, but a single period, and all that happened within that period to one person or to many,

little connected together as the events may be. For as the sea-fight at Salamis and the battle with the Carthaginians in Sicily took place at the same time, but did not tend to any one result, so in the sequence of events, one thing sometimes follows another, and yet no single result is thereby produced. Such is the practice, we may say, of most poets. Here again, then, as has been already observed, the transcendent excellence of Homer is manifest. He never attempts to make the whole war of Troy the subject of his poem, though that war had a beginning and an end. It would have been too vast a theme, and not easily embraced in a single view. If, again, he had kept it within moderate limits, it must have been over-complicated by the variety of the incidents. As it is, he detaches a single portion, and admits as episodes many events from the general story of the war – such as the Catalogue of the ships and others – thus diversifying the poem. All other poets take a single hero, a single period, or an action single indeed, but with a multiplicity of parts. Thus did the author of the Cypria and of the Little Iliad. For this reason the Iliad and the Odyssey each furnish the subject of one tragedy, or, at most, of two; while the Cypria supplies materials for many, and the Little Iliad for eight – the Award of the Arms, the Philoctetes, the Neoptolemus, the Eurypylus, the Mendicant Odysseus, the Laconian Women, the Fall of Ilium, the Departure of the Fleet.

24

Again, Epic poetry must have as many kinds as Tragedy: it must be simple, or complex, or 'ethical,'or 'pathetic.' The parts also, with the exception of song and spectacle, are the same; for it requires Reversals of the Situation, Recognitions, and Scenes of Suffering. Moreover, the thoughts and the diction must be

artistic. In all these respects Homer is our earliest and sufficient model. Indeed each of his poems has a twofold character. The Iliad is at once simple and 'pathetic,' and the Odyssey complex (for Recognition scenes run through it), and at the same time 'ethical.' Moreover, in diction and thought they are supreme.

Epic poetry differs from Tragedy in the scale on which it is constructed, and in its meter. As regards scale or length, we have already laid down an adequate limit: the beginning and the end must be capable of being brought within a single view. This condition will be satisfied by poems on a smaller scale than the old epics, and answering in length to the group of tragedies presented at a single sitting.

Epic poetry has, however, a great – a special – capacity for enlarging its dimensions, and we can see the reason. In Tragedy we cannot imitate several lines of actions carried on at one and the same time; we must confine ourselves to the action on the stage and the part taken by the players. But in Epic poetry, owing to the narrative form, many events simultaneously transacted can be presented; and these, if relevant to the subject, add mass and dignity to the poem. The Epic has here an advantage, and one that conduces to grandeur of effect, to diverting the mind of the hearer, and relieving the story with varying episodes. For sameness of incident soon produces satiety, and makes tragedies fail on the stage.

As for the meter, the heroic measure has proved its fitness by hexameter test of experience. If a narrative poem in any other meter or in many meters were now composed, it would be found incongruous. For of all measures the heroic is the stateliest and the most massive; and hence it most readily admits rare words and metaphors, which is another point in which the narrative form of imitation stands alone. On the other hand, the iambic and the trochaic tetrameter are stirring

measures, the latter being akin to dancing, the former expressive of action. Still more absurd would it be to mix together different meters, as was done by Chaeremon. Hence no one has ever composed a poem on a great scale in any other than heroic verse. Nature herself, as we have said, teaches the choice of the proper measure.

Homer, admirable in all respects, has the special merit of being the only poet who rightly appreciates the part he should take himself. The poet should speak as little as possible in his own person, for it is not this that makes him an imitator. Other poets appear themselves upon the scene throughout, and imitate but little and rarely. Homer, after a few prefatory words, at once brings in a man, or woman, or other personage; none of them wanting in characteristic qualities, but each with a character of his own.

The element of the wonderful is required in Tragedy. The irrational, on which the wonderful depends for its chief effects, has wider scope in Epic poetry, because there the person acting is not seen. Thus, the pursuit of Hector would be ludicrous if placed upon the stage – the Greeks standing still and not joining in the pursuit, and Achilles waving them back. But in the Epic poem the absurdity passes unnoticed. Now the wonderful is pleasing, as may be inferred from the fact that every one tells a story with some addition of his knowing that his hearers like it. It is Homer who has chiefly taught other poets the art of telling lies skilfully. The secret of it lies in a fallacy For, assuming that if one thing is or becomes, a second is or becomes, men imagine that, if the second is, the first likewise is or becomes. But this is a false inference. Hence, where the first thing is untrue, it is quite unnecessary, provided the second be true, to add that the first is or has become. For the mind, knowing the second to be true, falsely infers the truth of the first. There is an example of this in the Bath Scene of the Odyssey.

Accordingly, the poet should prefer probable impossibilities to improbable possibilities. The tragic plot must not be composed of irrational parts. Everything irrational should, if possible, be excluded; or, at all events, it should lie outside the action of the play (as, in the Oedipus, the hero's ignorance as to the manner of Laius' death); not within the drama – as in the Electra, the messenger's account of the Pythian games; or, as in the Mysians, the man who has come from Tegea to Mysia and is still speechless. The plea that otherwise the plot would have been ruined, is ridiculous; such a plot should not in the first instance be constructed. But once the irrational has been introduced and an air of likelihood imparted to it, we must accept it in spite of the absurdity. Take even the irrational incidents in the Odyssey, where Odysseus is left upon the shore of Ithaca. How intolerable even these might have been would be apparent if an inferior poet were to treat the subject. As it is, the absurdity is veiled by the poetic charm with which the poet invests it.

The diction should be elaborated in the pauses of the action, where there is no expression of character or thought. For, conversely, character and thought are merely obscured by a diction that is over-brilliant.

25

With respect to critical difficulties and their solutions, the number and nature of the sources from which they may be drawn may be thus exhibited.

The poet being an imitator, like a painter or any other artist, must of necessity imitate one of three objects – things as they were or are, things as they are said or thought to be, or things as they ought to be. The vehicle of expression is language – either

current terms or, it may be, rare words or metaphors. There are also many modifications of language, which we concede to the poets. Add to this, that the standard of correctness is not the same in poetry and politics, any more than in poetry and any other art. Within the art of poetry itself there are two kinds of faults – those which touch its essence, and those which are accidental. If a poet has chosen to imitate something, [but has imitated it incorrectly] through want of capacity, the error is inherent in the poetry. But if the failure is due to a wrong choice – if he has represented a horse as throwing out both his off legs at once, or introduced technical inaccuracies in medicine, for example, or in any other art – the error is not essential to the poetry. These are the points of view from which we should consider and answer the objections raised by the critics.

First as to matters which concern the poet's own art. If he describes the impossible, he is guilty of an error; but the error may be justified, if the end of the art be thereby attained (the end being that already mentioned) – if, that is, the effect of this or any other part of the poem is thus rendered more striking. A case in point is the pursuit of Hector. if, however, the end might have been as well, or better, attained without violating the special rules of the poetic art, the error is not justified: for every kind of error should, if possible, be avoided.

Again, does the error touch the essentials of the poetic art, or some accident of it? For example, not to know that a hind has no horns is a less serious matter than to paint it inartistically.

Further, if it be objected that the description is not true to fact, the poet may perhaps reply, 'But the objects are as they ought to be'; just as Sophocles said that he drew men as they ought to be; Euripides, as they are. In this way the objection may be met. If, however, the representation be of neither kind, the poet may answer, 'This is how men say the thing is.' applies to tales about

the gods. It may well be that these stories are not higher than fact nor yet true to fact: they are, very possibly, what Xenophanes says of them. But anyhow, 'this is what is said.' Again, a description may be no better than the fact: 'Still, it was the fact'; as in the passage about the arms: 'Upright upon their butt-ends stood the spears.' This was the custom then, as it now is among the Illyrians.

Again, in examining whether what has been said or done by some one is poetically right or not, we must not look merely to the particular act or saying, and ask whether it is poetically good or bad. We must also consider by whom it is said or done, to whom, when, by what means, or for what end; whether, for instance, it be to secure a greater good, or avert a greater evil.

Other difficulties may be resolved by due regard to the usage of language. We may note a rare word, as in oureas men proton, 'the mules first [he killed],' where the poet perhaps employs oureas not in the sense of mules, but of sentinels. So, again, of Dolon: 'ill-favored indeed he was to look upon.' It is not meant that his body was ill-shaped but that his face was ugly; for the Cretans use the word eueides, 'well-flavored' to denote a fair face. Again, zoroteron de keraie, 'mix the drink livelier' does not mean 'mix it stronger' as for hard drinkers, but 'mix it quicker.'

Sometimes an expression is metaphorical, as 'Now all gods and men were sleeping through the night,' while at the same time the poet says: 'Often indeed as he turned his gaze to the Trojan plain, he marveled at the sound of flutes and pipes.' 'All' is here used metaphorically for 'many,' all being a species of many. So in the verse, 'alone she hath no part.. , oie, 'alone' is metaphorical; for the best known may be called the only one.

Again, the solution may depend upon accent or breathing. Thus Hippias of Thasos solved the difficulties in the lines, didomen (didomen) de hoi, and to men hou (ou) kataputhetai ombro.

Or again, the question may be solved by punctuation, as in Empedocles: ‘Of a sudden things became mortal that before had learnt to be immortal, and things unmixed before mixed.’

Or again, by ambiguity of meaning, as parocheken de pleo nux, where the word pleo is ambiguous.

Or by the usage of language. Thus any mixed drink is called oinos, ‘wine’. Hence Ganymede is said ‘to pour the wine to Zeus,’ though the gods do not drink wine. So too workers in iron are called chalkeas, or ‘workers in bronze.’ This, however, may also be taken as a metaphor.

Again, when a word seems to involve some inconsistency of meaning, we should consider how many senses it may bear in the particular passage. For example: ‘there was stayed the spear of bronze’ – we should ask in how many ways we may take ‘being checked there.’ The true mode of interpretation is the precise opposite of what Glaucon mentions. Critics, he says, jump at certain groundless conclusions; they pass adverse judgement and then proceed to reason on it; and, assuming that the poet has said whatever they happen to think, find fault if a thing is inconsistent with their own fancy.

The question about Icarius has been treated in this fashion. The critics imagine he was a Lacedaemonian. They think it strange, therefore, that Telemachus should not have met him when he went to Lacedaemon. But the Cephallenian story may perhaps be the true one. They allege that Odysseus took a wife from among themselves, and that her father was Icadius, not Icarius. It is merely a mistake, then, that gives plausibility to the objection.

In general, the impossible must be justified by reference to artistic requirements, or to the higher reality, or to received opinion. With respect to the requirements of art, a probable

impossibility is to be preferred to a thing improbable and yet possible. Again, it may be impossible that there should be men such as Zeuxis painted. 'Yes,' we say, 'but the impossible is the higher thing; for the ideal type must surpass the realty.' To justify the irrational, we appeal to what is commonly said to be. In addition to which, we urge that the irrational sometimes does not violate reason; just as 'it is probable that a thing may happen contrary to probability.'

Things that sound contradictory should be examined by the same rules as in dialectical refutation – whether the same thing is meant, in the same relation, and in the same sense. We should therefore solve the question by reference to what the poet says himself, or to what is tacitly assumed by a person of intelligence.

The element of the irrational, and, similarly, depravity of character, are justly censured when there is no inner necessity for introducing them. Such is the irrational element in the introduction of Aegeus by Euripides and the badness of Menelaus in the Orestes.

Thus, there are five sources from which critical objections are drawn. Things are censured either as impossible, or irrational, or morally hurtful, or contradictory, or contrary to artistic correctness. The answers should be sought under the twelve heads above mentioned.

26

The question may be raised whether the Epic or Tragic mode of imitation is the higher. If the more refined art is the higher, and the more refined in every case is that which appeals to the

better sort of audience, the art which imitates anything and everything is manifestly most unrefined. The audience is supposed to be too dull to comprehend unless something of their own is thrown by the performers, who therefore indulge in restless movements. Bad flute-players twist and twirl, if they have to represent 'the quoit-throw,' or hustle the coryphaeus when they perform the Scylla. Tragedy, it is said, has this same defect. We may compare the opinion that the older actors entertained of their successors. Mynniscus used to call Callippides 'ape' on account of the extravagance of his action, and the same view was held of Pindarus. Tragic art, then, as a whole, stands to Epic in the same relation as the younger to the elder actors. So we are told that Epic poetry is addressed to a cultivated audience, who do not need gesture; Tragedy, to an inferior public. Being then unrefined, it is evidently the lower of the two.

Now, in the first place, this censure attaches not to the poetic but to the histrionic art; for gesticulation may be equally overdone in epic recitation, as by Sosistratus, or in lyrical competition, as by Mnasitheus the Opuntian. Next, all action is not to be condemned – any more than all dancing – but only that of bad performers. Such was the fault found in Callippides, as also in others of our own day, who are censured for representing degraded women. Again, Tragedy like Epic poetry produces its effect even without action; it reveals its power by mere reading. If, then, in all other respects it is superior, this fault, we say, is not inherent in it.

And superior it is, because it has an the epic elements – it may even use the epic meter – with the music and spectacular effects as important accessories; and these produce the most vivid of pleasures. Further, it has vividness of impression in reading as well as in representation. Moreover, the art attains its end within narrower limits for the concentrated effect is more

pleasurable than one which is spread over a long time and so diluted. What, for example, would be the effect of the Oedipus of Sophocles, if it were cast into a form as long as the Iliad? Once more, the Epic imitation has less unity; as is shown by this, that any Epic poem will furnish subjects for several tragedies. Thus if the story adopted by the poet has a strict unity, it must either be concisely told and appear truncated; or, if it conforms to the Epic canon of length, it must seem weak and watery. [Such length implies some loss of unity,] if, I mean, the poem is constructed out of several actions, like the Iliad and the Odyssey, which have many such parts, each with a certain magnitude of its own. Yet these poems are as perfect as possible in structure; each is, in the highest degree attainable, an imitation of a single action.

If, then, tragedy is superior to epic poetry in all these respects, and, moreover, fulfills its specific function better as an art – for each art ought to produce, not any chance pleasure, but the pleasure proper to it, as already stated – it plainly follows that tragedy is the higher art, as attaining its end more perfectly.

Thus much may suffice concerning Tragic and Epic poetry in general; their several kinds and parts, with the number of each and their differences; the causes that make a poem good or bad; the objections of the critics and the answers to these objections.